FOOD INDUSTRIES

manufacturing and processing

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Candy Manufacturers Face the Facts

ACCORDING to the well-documented opinion of Walter C. Hughes, secretary of the National Confectioners' Association of the United States, the candy makers closed the year 1929 with records of definite progress in connection with cost accounting, traffic problems, technical research, depreciation, capital assets, and several aspects of the always important topic of distribution.

On the other hand, he frankly and courageously counsels his associates to face the fact that the candy industry is by no means free from certain evils. These include price cutting, free deals, special secret discounts and rebates, punch boards and similar "sales stimulators," injudicious credit risks, and dirty factories.

As to the last-named source of trouble, we can—and do—assure Mr. Hughes, and through him his industry, that the dirty manufacturing establishment is not confined solely to the candy industry. But that is no excuse for the existence of foul food-making shops of any sort. Far from it.

Those who are so constituted as to be happier when dirty than when clean, belong in some line of activity other than food manufacture. And it behooves all of us to speed them on their way, no matter whose feelings may be hurt. For his frank utterance to candy makers who offend against the common law of fundamental cleanliness, Secretary Hughes is to be warmly commended. More strength to his elbow.

"Fish Is Not Meat"— Nor May It Be So Called

LABELING of fish and meat meals by misleading names has occasioned some difficulty recently with the inspectors of the U. S. Department of Agriculture. The department does not in any way criticize fish meal nor in any way imply for it less merit than meat meal; but it does insist that fish meal may not be properly called "meat" meal, or vice versa.

This is but one of the evidences of the proper insistence by federal officials on accurate and significant labeling of food byproducts. There is no reason why those marketing fish meal should not be proud of their product. Properly prepared, it has a very useful place in animal feeding. In fact, certain fish meals furnish a very high class protein and vitamin-carrying constituent. Inaccurate labeling is reprehensible in that it is against the interest of the producer quite as much as because it is a deception to the purchaser.

Speaking broadly, the day has passed when generic or carelessly phrased names suffice for food or feed products.

Rewarding Ignorance

NOW that the gentlemen who sell domestic refrigeration have staged their contest and have awarded the prizes in the Why-is-50°-the-danger-point prize essay contest, the public is permitted to learn exactly what the judges believe are the three most satisfactory statements. It is interesting to note in passing that the moot 50° has ceased to be a "danger mark." It is now a "safety point for perishable foods." We quote excerpts from those parts of the winning essays that have been published.

"The battle with bacteria has shown us that below 50° reproduction is greatly retarded. . . . Thus the modern housewife can eliminate costly spoilage and buy in greater quantities at cheaper prices. . . . But the greatest value of well-kept foods is in safeguarding health. Fresh, crisp vegetables and fruits are more palatable, more nourishing. Low temperature keeps germs in check, so that the body is able to resist disease. Above all benefits of proper food preservation is this vital function." (First prize, $10,000.)

"Cold is as harmful to germs as germs are to us. Fifty degrees is the crucial point in food values—for as degrees mount, your 'food efficiency' must of necessity show a corresponding decrease." (Second prize, $3,500.)

"Studies of various foods show that at temperatures ranging from 40° to 50°, bacteria multiply about $\frac{1}{100}$ as rapidly as above 50°. Hence foods should be kept below the safety point, both winter and summer." (Third prize, $2,000.)

FOOD INDUSTRIES has no present reason to doubt the sincerity of those who made these statements, but we feel a sense of regret that misunderstandings should not only be handsomely rewarded but that it should be further broadcast. The large number of letters received

at this office early in the contest requesting complete bibliographies of the scientific literature of food preservation by refrigeration indicated clearly that many contestants were earnestly seeking truth. But from the very nature of the contest the outcome could hardly have been otherwise, as was noted in FOOD INDUSTRIES, page 524, June, 1929.

To attempt to explain the full facts about the misunderstood aspects of food refrigeration requires too much space for an editorial. There is so much that ought to be said in favor of adequately low refrigeration temperatures that we regret to see the facts gagged by the tie-up of disease prevention with an arbitrary temperature.

A certain type of question is typified by the hoary joke: "Have you stopped beating your wife. Answer by yes or no." It strikes a false note. So does the question, "Why is 50° the danger point?" It cannot be answered truthfully and simply, any more than one can answer the old joke in the same way. The more one knows about it the more impossible it is for him to tell why 50° is the danger point—or even the safety point. On careful perusal of the list of prize winners we can find only two names we can recollect that rate as authorities, or even as near-authorities. Therefore, it is not surprising that a well-known expert domestic scientist or an able designer of food manufacturing plants should draw only a $5 prize, instead of the $10,000 award.

If the basis of the contest had been a logical query, such as why should every home have adequate food refrigeration, or why should food be kept at temperatures only slightly above the freezing point, instead of the trick question, "Why is 50° the danger mark?" we believe that "the greatest mass research in all history" would have been productive of more valuable results, that more contestants would have entered, that its educational value would have been greater, and that certainly the publicity value would have been far greater.

Health Foods and Health Fads

BACK in the days before tasteless castor oil, when ounces of prevention in medical science were well hidden beneath pounds of cures, the dividing line between things that were "good" and things that were "good for us" was all too well defined. Only to the halt, the lame and the blind, and to the dyspeptic spinsters of the time, did the "health foods" make their appeal—and the nearer they came to nauseating, the more beneficial they were considered by the self-conceived invalids who smiled grimly and swallowed hard.

Fortunately enough, preventive medicine and dietetic science combined to swing the pendulum the other way: we found that most of the "good" things are really "good for us." But the swingers did not realize that the entire citizenry of these United States would be bowled over by the pendulum. They had hardly established the close connection between dietetics and health before the relationship came to be worshiped.

The boasters who formerly were "so healthy they could eat anything" now attributed their health to the things they ate; the self-conceived dyspeptics began to examine breakfast-food packages for doctor's indorsements, and countless millions, looking through the rose-colored glasses of ignorance, saw in the magic word "vitamin" a cure for half the world's ills. As a result, "the term 'health giving' is now the most overworked and most loosely applied expression in advertising," according to Dr. Paul B. Dunbar of the Food and Drug Administration.

It is one thing to realize the importance of dietetics in maintaining health; it is another to consider foods as glorified medicines. When an imposing signature, a row of bright-red capitals, or an advertising writer's polemic distorts a normal diet of wholesome food for the sake of certain curative benefits for which the healthy individual has absolutely no need, there arises to plague the food industries the horned specter of the patent-medicine evil.

Is it not more desirable to eliminate from the labels and advertising of food anything that smacks of health claims, and to base selling appeal on the good character, quality and honest food value of the product?

Signs of the Times

THE CURRENT business recession seems to have affected the food industries but slightly. A few instances have been reported where shipping instructions have been deferred on future contracts involving carload orders, but those same firms report current sales have continued at the level normal for the period of the year.

Those who scan news for the signs of the times may see unfavorable signs in the unemployment reports, but one must look farther than these surface indications if one is to read the future with certainty. Unemployment is in the same class of events with the stock-market crash. Both are the results of casual events that have gone before, although both may in turn be the cause of secondary results, the chief of which will be a diminished purchasing power on the part of the public.

Looking into the future, the biggest and most outstanding indications are the very low inventories in those manufacturing concerns to which we have access, the fairly satisfactory volume of current business in the food field, and the bank statements that have been published recently.

The relative absence of borrowings from the Federal Reserve Bank by member banks indicates, for the present at least, that the bank credit structure of the country has not been unduly stressed. But far more important than this negative sort of good news is the positive fact that inventories in most lines have been scraped to the very bottom. Buying in the necessity lines, such as the foods, continues at reasonably good rates. Early resumption of buying may be expected in the other lines because of these low inventories.

Louisville Vignettes—No. 2

MANUFACTURERS who market their products through wholesalers know only too well the call for lower prices that so often is based on claims of mounting sales expense. That sometimes there may be justice in such claim, but more often there is not, seems to be borne out by the experience of some wholesalers who have taken to heart what Louisville figures indicated.

One Central Western wholesaler, after visiting Louisville, proceeded to study his own business from the standpoint of present status and potentials for the fu-

ture. After careful analysis he cut 30 per cent of all his customers off the salesmen's list and closed out their accounts as promptly as collection of outstanding balances could be effected. Shortly thereafter he found that he could do with one less salesman; the remaining salesmen, having a substantially smaller number of calls to make, gradually increased their sales per customer. The average size of individual orders grew tremendously.

After one month of hesitation, immediately following the establishing of the new policy, sales began to increase and have steadily increased ever since, together with a better rate of profit. Truly this wholesaler is building a most satisfying outlet for the manufacturers who supply him.

Frozen Food Manufacturers Are Facing a Real Problem

THE PROCESS of quick-freezing is not new, although it has gained recent sudden popularity through the work of Cooke, Taylor, Birdseye, Kolbe, Petersen, and others. As a matter of fact, the discovery of the principle of quick-freezing dates back something like 30 years. Its useful application today is traceable to comparatively recent advances in refrigerating engineering and mechanical refrigeration.

The very romance and intriguing simplicity of the theory of quick-freezing leads many into extravagantly optimistic predictions for the future of the industry, all of which would be very well and good except for one little difficulty—a difficulty that is not insurmountable but one that is a decided impediment for the moment. The existence of this difficulty has not often been suspected by inquirers outside the group that is immediately interested.

The most serious problem facing the manufacturers of frozen foods today is that of distribution, because frozen foods must be kept frozen from the point of origin to the ultimate consumer. Differing from canning in this important respect, freezing, whether it be quick or slow, will preserve food only as long as it is kept frozen. As soon as it thaws out it will begin to spoil, just as it would have spoiled had it not been frozen originally.

Also, there is a widespread tendency to concentrate attention on the single operation of freezing. As a matter of fact, the entire chain of events from raw materials in the plant to the consumer's kitchen should be considered. A perfect job of freezing may be done, and a poor product delivered to the consumer because of some faulty procedure in packaging, storing, refrigerator-car transportation, or in the retail store.

In the United States today there is a distinctly limited supply of distributor and dealer refrigeration equipment that is adequate to handle frozen foods. The ordinary types of mechanical refrigerators in meat markets and stores will not serve properly unless they are capable of maintaining temperatures of from 15° to 25° F. Any manufacturer of mechanical refrigerators can supply the necessary equipment, it is true, but immediately the question arises as to who is going to pay for it. It is suitable only for the distribution of frozen foods, and if any foods other than these are placed in such refrigerators they, too, will be frozen and possibly ruined. Then, since it has a limited use, who shall pay for the low-temperature refrigerator and for its operation and upkeep—the manufacturer of frozen foods, or the dealer?

Up to the present the manufacturer has been shouldering the burden. One of the largest manufacturers of frozen foods, the Atlantic Coast Fisheries, has purchased a great number of such refrigerator units, but, although their cost in large lots is relatively low, it is possible to tie up huge sums of capital in this way. If one manufacturer puts up all the money for many such units, shall he have control over them and dictate what may or may not be sold from them?

On the supposition that but a single product is to be sold from these refrigerators, the whole cost of operation and amortization must be charged against sales so made. Often the assessment of full charges will run the cost up to figures placing the product out of competition with naturally competitive products.

The meat packers are about to enter the frozen-food markets and are facing the same problem. The fish and ice cream people are already in it. Frozen fruits, particularly strawberries, are often available where freezer distribution is at hand. Several firms are reported to be experimenting with quick freezing of vegetables by the Birdseye process, but everyone comes face to face with the same problem of dealer refrigeration.

What is the solution? Pending the time that the retailer is willing to absorb the charges involved, it would seem possible to handle it by co-operation. Manufacturers of frozen foods acting jointly might well provide a working arrangement whereby adequate dealer refrigeration may be financed and installed, proper provision being made for each of the frozen foods to be merchandised.

In the ice cream industry—the sale source of analagous experience—the manufacturers have borne the expense of, formerly, iced cabinets, averaging $50, and, latterly, mechanically refrigerated cabinets, costing nearer $400. Eloquent testimony as to the unhappy state of affairs so induced is the fact that in some states legal provisions make it a misdemeanor for the retailer to use such cabinets for products other than those of the manufacturer whose property they are. If the newcomers to the frozen-food field adhere to a similar policy, the logical outcome would be a row of special refrigerators in every store, each separate unit owned by some manufacturer of frozen meats, fish, fruit, or what not.

Of course that plan would be absurd! No storekeeper would permit such waste of space; rents are too high and costs of operation too great. If the frozen-foods industry is to go ahead, a plan must be evolved that will give each store a refrigerator of a sort adapted to the handling of the different frozen products, with costs per commodity so figured as to permit retail sales at reasonable prices. Although ice cream is sufficiently well established to permit its sale from covered, opaque containers, it is generally believed that frozen foods must be displayed, if people are to be expected to buy. Display refrigeration has problems of its own, in addition to the fact that it is known to cost more than non-display refrigeration.

The whole problem of distributor refrigeration needs full discussion. Can the dealer be persuaded to install proper refrigerated cabinets in anticipation of the growing frozen food industry? Should a corporation be formed to finance, install, and service "community" refrigerators? If such a corporation is formed, should it continue to own them or sell them to the distributor? Should manufacturers go it alone, install their own refrigerators in dealers' stores and charge a rental from other manufacturers?

Baskets of Chinese eggs on their way to the plant.

OUT OF THE EGG

Comes a Growing Industry

THE STORY OF FROZEN AND DRIED EGG PRODUCTS

By L. G. CONNER
Food Products Investigator, Washington, D. C.

A SWEEPING change has occurred in the use of eggs in the United States since 1900. At that time nearly every egg consumed was taken directly from the shell by the user. One domestic company had just begun to prepare frozen eggs as a salvage proposition. This activity grew slowly, though steadily, until 1922. Thereafter the industry expanded rapidly. There also was some drying of egg meats in this country after 1900, mainly by means of machinery developed for milk drying. This activity ceased after 1918, owing to the increased demands of egg freezers for undergrade eggs, or seconds, and also as a result of competition from China. The only egg drying done in the United States since 1918 was in 1927, when two small plants were operated, partly as an experiment and partly to supplement supplies from China, where the civil war interfered with shipments.

Frozen eggs, or, more properly, frozen egg products, consist of: unseparated egg meats, i.e., "whole," or "mixed" eggs; yolks; and whites. The meats are removed from the shells, frozen solid, and so held in airtight tin cans until thawed out for immediate use. In the large market centers, chiefly during the height of the breaking season, there is considerable production of "chilled" whole eggs, yolks, and whites, prepared as for freezing but only partly congealed, and contained in large cans similar to milk cans. These are delivered to users as fast as prepared, and result in a small saving on freezing and carrying charges, and on containers, as the large cans may be used repeatedly. Possibly as much as 10 per cent of the egg meats are delivered in the chilled form. Dried egg products consist of dried whole egg, yolks, and whites, the latter being known in the trade as egg albumen.

Between 1921 and 1927 the production of frozen eggs in the United States increased about 200 per cent. This resulted chiefly from developments in the whole-

Statistical Data Covering Eggs and Egg Products

	Shell eggs (Thousands of dozens)		Frozen eggs (Thousands of pounds)						Dried Eggs (Thousands of Pounds)				Shell Egg Equivalent of Consumption of Egg Products in Thousands of Dozens	Per Cent Imported
	(1)	(2)	(3)	(4) Imports				(5)	(6)	(7)				(8)	(9)
Year	Production	Imports	Production	Whole Eggs	Yolks	Whites	Total	Apparent Consumption	Per Cent Imports	Whole Eggs	Yolks	Albumen	Total		
1921	1,900,000	3,063	45,960	9,045	4,500	4,753	18,298	64,258	28.5	2,001	6,325	2,643	10,969	92,005	58.4
1922	1,950,000	1,019	49,245	7,765	4,500	4,250	17,015	66,261	25.7	3,008	4,960	3,289	11,257	95,612	57.1
1923	2,050,000	394	71,019	3,528	2,253	910	6,691	77,710	8.6	1,595	1,553	2,726	5,874	89,588	33.9
1924	1,913,245	347	57,382	5,858	4,297	1,476	11,631	69,013	16.8	1,590	4,016	2,947	8,553	88,213	45.8
1925	2,003,000	476	78,577	11,935	6,201	4,292	22,428	101,006	22.0	2,521	5,591	3,150	11,262	122,227	46.4
1926	2,120,000	298	92,041	10,622	4,238	3,657	18,517	110,558	16.8	1,575	5,461	3,458	10,494	128,766	40.4
1927	2,162,000	250	129,144	2,797	2,816	1,560	7,173	136,317	5.3	880	3,209	3,368	7,457	146,183	24.3
1928	2,195,000[1]	281	148,068	5,350	2,208	606	8,164	156,232	5.2	852	4,371	2,752	7,975	162,090	20.3

[1] Preliminary.

sale baking, noodle, mayonnaise, and similar industries. Large companies which had formerly insisted on the use of case (shell) eggs turned to frozen egg products, for reasons of economy and quality. Combinations made to meet the competition of such companies, on the basis of quality as well as price, resulted in a further expansion of the demand for eggs in the frozen forms. Also, many users who previously had depended on dried eggs, turned to frozen eggs for reasons of quality or economy, or both.

At the same time, there has been an expansion of operations, or a change of formulas, by many users whose product requires dried eggs, such as baking powder. This development has maintained practically undiminished the demand for dried-egg products, in spite of the sweeping displacement of the dried product by frozen eggs in uses where the two forms are interchangeable. Dried eggs are produced only in China.

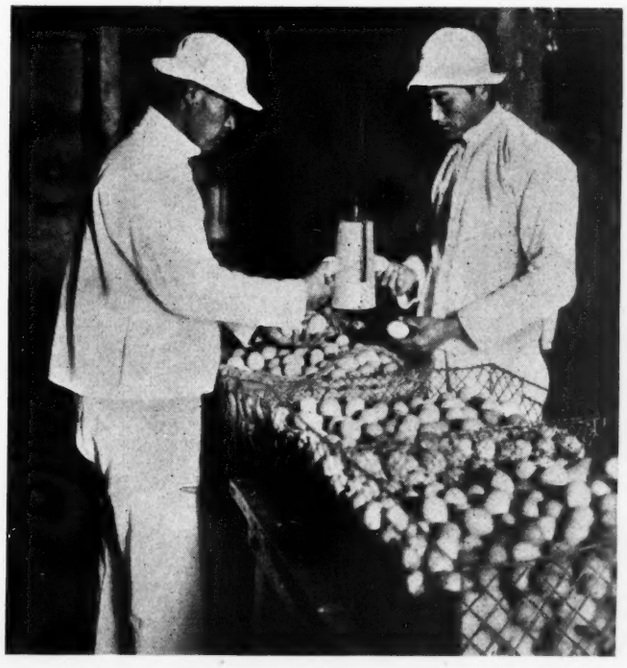
The accompanying tabulation, covering the period 1921 to 1928, shows: (1) the approximate volume of domestic shell-egg production; (2) Imports[1] of shell eggs; (3) domestic production of frozen-egg products; (4) imports of similar products; (5) apparent domestic consumption of frozen-egg products; (6) percentage thereof supplied by imports; (7) imports of dried-egg products, which constitute the United States consumption; (8) the equivalent, in terms of domestic shell eggs, of the production and imports of frozen eggs and imports of dried-egg products; and (9) the percentage of this total made up of imports.

With the rapid growth of domestic egg freezing since 1921, there was a marked change in the type of "breaking stock," or grade of eggs used. In 1921 two-thirds of the eggs broken consisted of undergrades — misshapen, dirty, checked (lightly cracked), cracked eggs, and "leakers," that is, eggs so badly cracked that the egg meats oozed from the shell. At the present time, leakers are rarely used except by small local plants supplying a cheap trade. Other undergrades constitute about two-thirds of the raw material for breaking plants in the market centers, where one-third of the egg-breaking is done. For the industry as a whole, however, two-thirds of the breaking stock are "shippers' firsts," or standard-grade eggs prior to the sorting out of the larger, more attractive sizes, and pullets' eggs, or "peewees." The latter are unprofitable to break, owing to their low yield of egg meats. The undergrades are first-rate breaking stock from March until about July, the usual breaking season, but they do not carry well in storage. Their use as a raw material enables the city breaking plants to compete with those at country points, where prices of shell eggs and freight charges are lower, and also helps to raise the general quality of storage eggs.

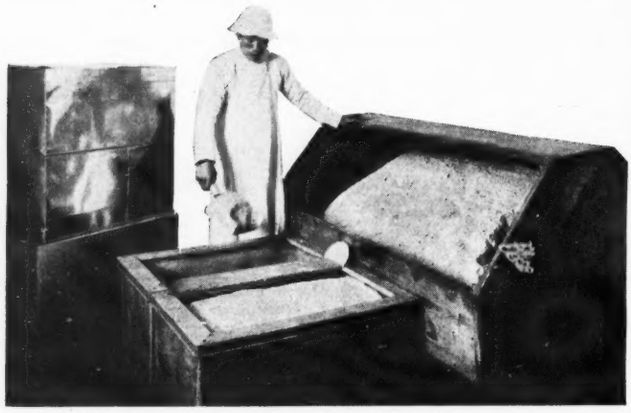
In China, the freezing of eggs is done at the treaty ports, that is, at the large market centers. These are so far from the sources of raw material, in time rather than miles, that no reliance can be placed on undergrades if a high quality of product is desired. As all freezing is done in plants owned, controlled, or supervised by foreigners, and as quality is a prime factor, Chinese breaking is predicated on high-quality eggs. The undergrades are disposed of in the local markets for consumption by the native population.

A case of 30 dozen domestic eggs weighs about 42 pounds net, and, without candling-room rejects, yields 35 pounds of egg meats. The same number of Chinese eggs weighs 35 pounds and yields 28 pounds of egg meats. Owing to a heavier shell, the yield of meats averages only 80 to 81 per cent of the weight of shell eggs broken in China, as compared with 84 per cent in this country.

EXPERT CANDLERS at work in a Chinese plant. All but the high-grade eggs (the "selects") are returned for local consumption.



[1] All import figures are amounts entered for consumption. The imports of shell eggs during recent years have consisted chiefly of preserved duck eggs brought in for use as a delicacy by Chinese living in the United States. Such eggs are not competitive with domestic production.



FILLING TIN-LINED CASES with dried egg product. The cases are rendered airtight before shipment.

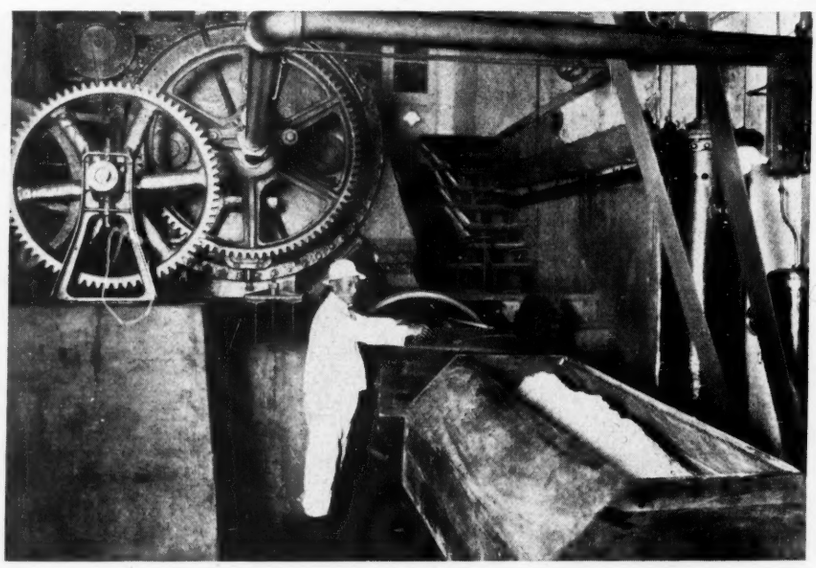
In the United States many of the interior breaking plants boast that their eggs are not more than 48 hours from the nest. Plants in the central markets state that their breaking stock usually is not over 4 or 5 days from the nest, and that during a large part of that time the eggs have been in cold storage or in cool quarters. Unless carelessness enters the situation, there is relatively little chance for spoilage other than that from the usual hazards of shipping, such as checking and cracking.

In China the eggs are gathered by country hawkers, who at other times are farm laborers. At first a single round-trip may last as long as a week. Toward the end of the breaking season, when temperatures and humidity are very high, a collection trip lasts only 2 or 3 days and if 5 per cent of the eggs are heated the entire lot is rejected by buyers at interior market points. From 2 to 8 days are required for the movement of eggs from interior points to the treaty ports.

As the season advances, the more distant interior points automatically disappear from the market, because refrigeration en route is unknown, and because if heating starts in the baskets, each containing about 500 eggs, the contents is a total loss in a few days' time. Early in the breaking season (about March 15 to July 15), Chinese factories which are careful in buying have about 2 to 3 per cent of candling-room rejections. These are returned to the shippers or local market agencies. By July 1 this may be as high as 15 per cent. In the United States such rejections range from about 1 per cent, or less, early in the season, to not over 4 or 5 per cent by July 15.

The primitive methods of transportation from interior points explain in large part why no other country seems able to compete with China in the drying of eggs. Much of this is done at large plants located along the Yangtse River west of Shanghai, and as far inland as Hankow. The farther from Shanghai, the cheaper are the eggs. In the early part of the season Shanghai gets eggs from as far as Hankow. As the breaking season advances such shipments become less frequent, because of the length of time the eggs are en route before they can be loaded on steamers. After about May 1, the price differential tends to be wider than the additional freight charge, owing to the risk of spoilage on shipboard. Labor also tends to get cheaper up the river. Moreover, considerable drying is done in more or less primitive plants at interior points from which it would be very hazardous to ship shell eggs after April 15 or May 1, and naturally the local price is relatively low. On the other hand, freight and other charges, although higher per pound, are distinctly favorable to the shipment of the dried-egg products. From the foregoing it is obvious that the typical dryer of Chinese eggs has a pronounced advantage over the freezer in cost of raw material, the dominant factor in cost of finished product.

Notwithstanding his use of "selects," the freezer gets his raw material for about 57 per cent of the American cost, and his direct labor charges are only about 20 per cent as much as in the United States. These savings per pound of frozen eggs far more than offset a 50-per cent higher charge for factory overhead and administration, and give to the producer of frozen-egg products in China a large advantage over his American competitor. Higher charges in China for factory overhead and administration (including supervision) result from the use of modern, cold-storage plants which have to be erected chiefly for the purpose of egg freezing. The egg business is supplemented by other cold-storage activities as much as possible during the off-season, but the overhead burden on frozen eggs is not lightened



A VIEW in the evaporating plant. The bin in the foreground contains 1,000 pounds of dried eggs.

THE MARKET offers three types of dried egg product—whole eggs, white (albumen) and yoke.

a great deal by this means. Moreover, relatively high-salaried foreign (American or British) experts are used to insure proper technique and sanitary precautions on the part of the native labor. In the United States, a large part of the egg-freezing is done in space rented for the season in cold-storage plants erected primarily for other purposes, or the egg freezing serves as a "fill-in" with companies whose major activities are along other lines—such as general produce merchandising, poultry packing, butter manufacture, or a combination of these.

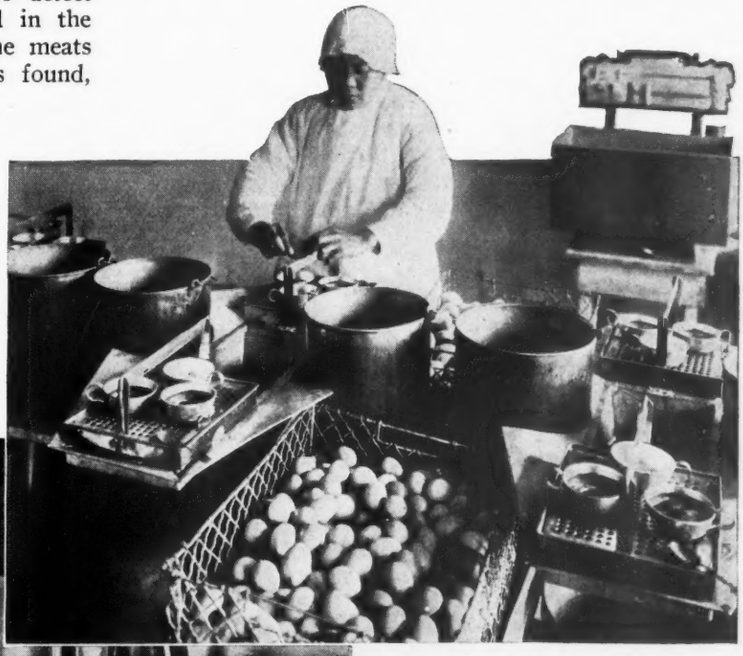
It is asserted that the relatively small amount of administrative and supervisory labor needed in the United States reflects higher levels of personal hygiene characteristic of this country. However that may be, the accompanying illustrations, used through the courtesy of the Henningsen Produce Company, of Portland, Ore., demonstrate that sanitary working conditions are possible of attainment in foreign-owned, Chinese egg-product plants.

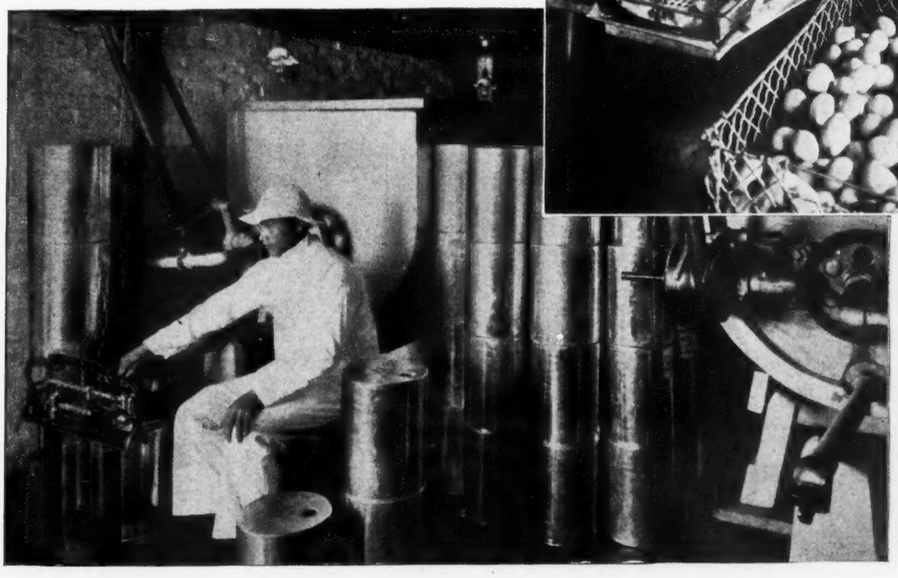
There is no difference in methods of production of frozen-egg products in the United States and in China. The shell eggs normally are chilled and then candled to remove those not desired for freezing. If not previously chilled, this may be done after candling, in order to facilitate the separation into yolks and whites in the breaking room. Skilled women break the eggs by striking on a blunt knife-edge. If not to be separated, the meats then are dropped into a small cup. The latter is emptied into a larger container after every second or third egg is broken, but is first smelled to detect possible mustiness. These cannot be isolated in the candling room, and one of them can ruin the meats of several cases of eggs. If a musty egg is found, the contents of the cup are "dumped" and the container is washed and sterilized before being used again.

If separation is to be made into yolks and whites, a small concave disk is attached beside the knife-edge and above the cup for the whites. The disk catches the yolk, which is then deftly emptied into an adjoining cup. Unseparated eggs and egg yolks are churned to obtain a homogeneous mixture before being poured into cans for freezing. The whites are not agitated, as this would damage them for use after thawing. When the standard tins are solidly frozen, a small additional quantity of liquid is poured in, if necessary, to obtain the proper net weight. The cans then are sealed and held at a temperature of about 15° F. until shipped.

When eggs are dried, the methods of preparation are the same as for freezing up to the time liquid egg leaves the breaking room. The egg whites then are placed in vats to ferment, settle, and clarify. The acidity which always develops is neutralized with ammonia. After churning, the liquid yolks or whole eggs go directly from breaking room to the drier, where approximately 90 per cent of the moisture is removed. This moisture content averages about 72 per cent for whole eggs, 50 per cent for yolks, and 86 per cent for whites. On the average, about 3.56 pounds of whole eggs, 2.23 pounds of yolks, and 7.3 pounds of whites, yield 1 pound of the respective dried products.

Dried egg yolk is made chiefly by the spray process, adapted from American milk-drying machinery. Liquid yolk is sprayed under high pressure into the upper part of a chamber heated to 160° F. or more. It is gathered as a fine powder, and packed into airtight, tinlined, wooden cases, usually of 200 pounds net weight. Sometimes it is packed into barrels lined with paraffin paper, but this is the exception for export to the United States. Some yolk is dried on aluminum belts, drums, or disks, which revolve through chambers heated to about 140° F.





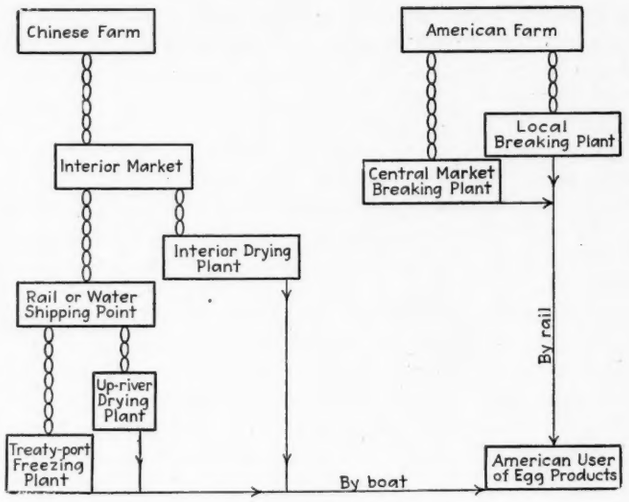
ABOVE: A SKILLED BREAKER at work. After 2 eggs are broken, the cup is smelled to detect the possibility of a musty egg. Clean uniforms are provided every day.

LEFT: WEIGHING LIQUID EGGS into cans from refrigerated tanks. The eggs are then frozen for shipment abroad.

Each revolution of the machine dries a film of the liquid, layer after layer of which is added until the requisite thickness of the sheath of dried product is obtained. This is then scraped off with a knife, and further drying may be done on trays to insure the proper removal of moisture. The flake product then may be ground prior to packing for shipment. It is of higher solubility than spray dried yolk, and, therefore, more valuable. This method is more commonly used, however, in the drying of unseparated egg meats, with the temperature held at about 130° F., in order to avoid coagulation of the albumen.

Egg albumen coagulates at about 126° F., and usually is dried at 120° F., on belts or in shallow trays. The operation is finished on fine screens at about 110° F. Albumen is rarely ground before shipment, as it is preferred in the flake form, to insure that there has been proper removal of a portion which always coagulates. If allowed to remain, this will lower the whipping property of the lot. A certain percentage of siftings is allowed on deliveries in this country, but these are presumed to result from handling en route. The coagulated siftings are always removed by reputable shippers from China. Unless there is a low-grade foreign outlet for them as such, they are "dumped." Siftings from deliveries to exporters from native Chinese factories are dumped, because if returned to the seller, the coagulated albumen might reappear in later deliveries in the hope that it would pass inspection.

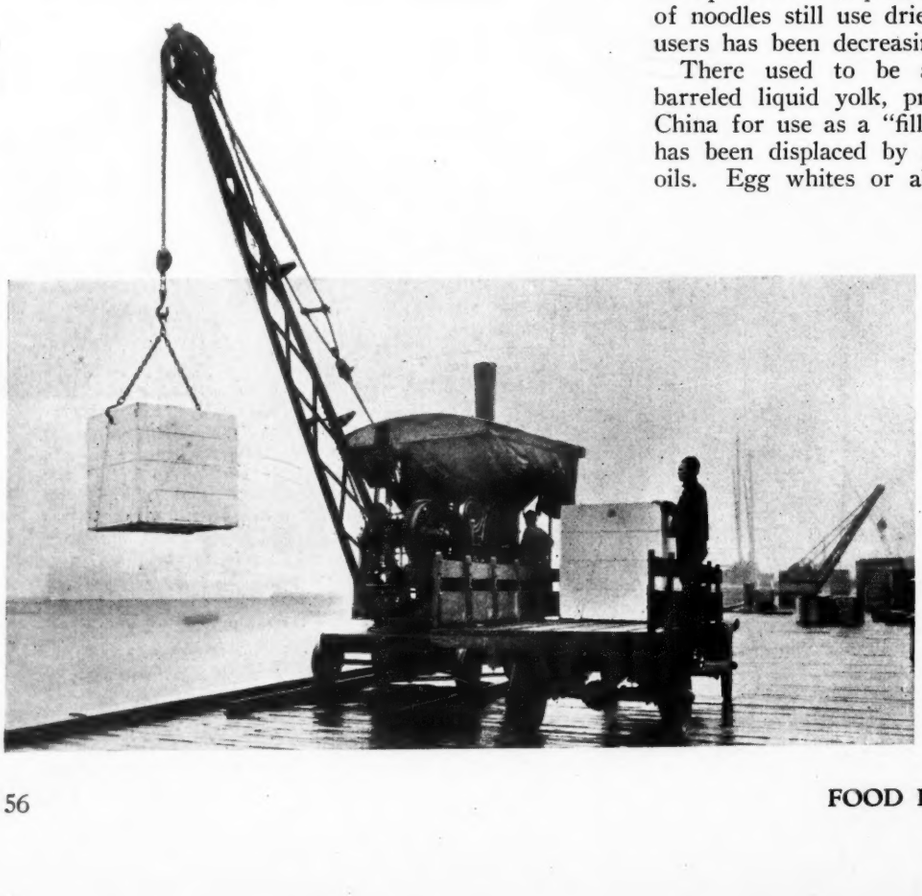
At the present time, frozen eggs have almost entirely displaced dried eggs in this country with respect to products where either might be used. Frozen eggs enter into cake, pie, and pastry baking and noodle manufacture. Frozen whites are used for a part of their output by one or two candy manufacturers, and frozen yolks by a few ice cream makers. Manufacturers of mayonnaise supply a large part of the demand for frozen yolks. Dried yolks and whole eggs are used mainly in prepared cake, pastry, doughnut, and pancake flours,



FLOW SHEET of egg products, both foreign and domestic.

which are especially convenient for small bakers and housewives. Dried yolks are extensively used in ice-cream making and in prepared ice-cream "mixes." Considerable technical skill, particularly with reference to pasteurization, is needed to replace dried with frozen yolks in ice-cream making, and relatively few of the larger plants have yet been able to do this. Dried albumen is used in prepared whipping powders, and is especially valued for use in powders to give a tough meringue for cream and other soft pies. The chief demand for albumen, however, comes from confectioners for use in cream centers, nougatines, and marshmallow whips, and from baking-powder manufacturers. There is still a limited use of dried whole egg and yolk, chiefly the former, by some of the smaller bakers. Either they cannot use a can of frozen eggs a day and lack refrigeration facilities to carry over part of a can, or else they prefer the dried product because less skill is required to manipulate it. A few small manufactures of noodles still use dried yolks. The number of such users has been decreasing rapidly during recent years.

There used to be a considerable importation of barreled liquid yolk, preserved with boric acid, from China for use as a "filler" in leather tanning, but this has been displaced by animal and vegetable fats and oils. Egg whites or albumen also have been largely displaced by other agents in the sizing of fine paper for "fixing" of colors in textile printing, and for sensitizing photographic plates.



INSULATED CASES containing cans of frozen eggs being lowered to a lighter for transfer to the refrigerated hold of a steamship.

Louis W. Haas (right) and Ralph M. Bohn examining an experimental loaf

Baking Science Finds

A NEW METHOD
Of Preparing White Bread

By L. A. RUMSEY
W. E. Long Company, Chicago

"THE PUBLIC is becoming sophisticated in its choice of foods these days," remarked Dr. Morris Fishbein some time ago as we were discussing some of the newer applications of science to the preparation of packaged foods. That they are becoming more discriminating in their choice between bulk goods and high-quality, packaged foods is very evident when we look through the spotless windows of the successful, modern grocery store and see the attractiveness of the goods displayed on shelf and rack. These wonderfully attractive packaged foods in glass or tin or wax wrapper have not come without careful research and hard work on the part of the manufacturer.

Application of modern, mass-production methods to any food product involves a maximum of accurate control from the growing of the raw materials through every process of blending, cooking, drying or baking, in the canning or packaging, as the case may be. Science stands guard at every operation to see that purity, flavor, or nutritional value are not impaired by undesirable organisms or destroyed by improper treatment. Color, too, has received its share of attention. In some cases the preservation of natural color without treatment with chemical fixitives has been the object. In others, a bleaching effect has been sought. Some fruits, for example, can now be bleached and their ripening hastened by proper application of gaseous chemicals. Proper storage conditions have been worked out for improving the flavor and color of many foods.

The miller of wheat flour, using the roller type of mill, has constantly sought to improve the quality and at the same time to eliminate the indigestible branny particles which darkened and coarsened the product. Further bleaching during the milling process was quite generally used to secure the whiteness of color that has become the mark of excellence for good bread. The baker added milk in increasing quantities to commercial bread to raise still higher its standard of nutritive value. Shortenings were more carefully purified to preserve the delicacy of flavor. Marvelous developments in machinery and ovens were brought about to increase production of a better bread. Great laboratories were erected to study the problems of fermentation and aid in the development of the more perfect loaf.

For 25 years science has been searching in the laboratory and in the bake shop for the better way to make the rich and flavorful loaf of creamy white bread that the discriminating consumer stamps with her indelible mark of preference. It remained for Louis W. Haas and his co-worker, Ralph M. Bohn, in the research laboratories of The W. E. Long Company in Chicago, to

borrow from nature herself the key to the secret of natural white bread.

For more than two years they sought for a method of clearing up the yellow color of the natural flour from the heart of the wheat berry, without resorting to chemical reagents. Approximately 1,000 samples of wheat flour a month went through their hands, and almost every kind of natural plant enzyme preparation was tried. At last a material was found, and from a most unexpected source, which showed a very positive bleaching effect on the flour pigment. It was an extract of the common soya bean. Further tests led to a method for treatment of the original soya bean, yielding a product which showed an increased strength of decolorizing action. Such a preparation, however, would be much too strong for use in a commercial way, and it was found possible to dilute the material with inert starches. From there on the problem was extremely easy, because the new product gave excellent results and few difficulties in either laboratory or commercial tests.

Soya bean meal and flour have, of course, been used by man as food for ages and such material could only add to the desirability of any food product to which it might be added. It seems strange now when we look back on the years of work that have been expended on soya bean products, their use as food, and the attempts to exploit them as a special food for diabetics, that no one had stumbled onto or made use of this bleaching effect.

It may be due to the fact, as in the case of Dr. LeClerc's work in the U. S. Bureau of Chemistry, that whenever wheat flour was employed it had already been bleached by chemical action or else used in the presence of a medium which minimized the decolorizing action. Nevertheless, through the aid of the science of fermentation and the assistance of the old, yet new, product, the baker now has it in his power to take the natural, unbleached flour from the heart of the wheat berry and turn it into a white loaf of bread as smooth as silken velvet. This application of the alchemy of plant enzymes has given the baking industry a naturally desirable, wholly unobjectionable process for accomplishing the end in view. As soon as sufficient tests of the material had been made to prove its commercial value, it was given a trade name synonymous with its nature and use, and it is now merchandised in quantity to the baking industry as Wytase.

J. R. SHORT

The research work had been undertaken under contract for a far-sighted miller of cereals who was constantly seeking new and better products. The rights to manufacture, to control, to sell the new substance, therefore, belonged to Mr. J. R. Short, president and manager of the J. R. Short Milling Company, Chicago.

The new method for producing a white loaf of bread from unbleached flour was announced first to the public in nationally distributed newspaper advertising. Those announcements appeared on April 21 and 22, 1929. Formal announcements made in the trade journal advertising, and demonstrators working in the bakeries, have helped to explain the nature of the new ingredient and the methods for its use.

The American bread-consuming public have shown beyond all doubt that they prefer the fine-textured, but fully-flavored white loaf of bread as an important part of their standard dietary. Any method of bread production which will preserve or intensify the nutty, wheaty flavor of good flour, and still produce a loaf of the desired whiteness, should therefore claim a premier position in the process of commercial bread making.

Wytase fulfilled that requirement. During mixing, it may be added in amounts of 0.75 to 1.5 per cent to a dough made from natural unbleached flour, and, as fermentation proceeds, the yellow color is gradually removed until any desired degree of whiteness may be obtained in the finished loaf. All of the natural, desirable wheaty flavor of the original flour is preserved and even intensified, to the end that the consumer notices and appreciates the difference hours after the loaf is baked. Toasting the bread makes the improvement of flavor still more noticeable.

The second most desirable characteristic of any new ingredient used in the baking industry is that it shall simplify, rather than complicate, the standard commercial baking process. Wytase qualified in this respect because it has no appreciable effect on the course of normal fermentation. No other changes are needed in fermentation procedure or handling of makeup. Wytase is incorporated into the dough by stirring it up for a few minutes with water, and pouring this mixture into the balance of the dough or sponge water.

Another outstanding advantage of the use of Wytase was in the elimination of the many bake shop troubles, in so far as they have to do with heavy or excessive artificial bleaching of the flour used in the commercial shop, which have been all too prevalent during the past few years. Now the tendency toward such fermentation difficulties, such as "bucky" doughs, poor grain and texture, holes in bread, and a lack of fermentation tolerance, are no longer obstacles to the production of uniform, high-quality bread. Fermentation control depends entirely on the natural characteristics of the unbleached flour.

When the doughs made by the Wytase method from unbleached flour reached the machines, a decided improvement was noticed in the way they handled. As a consequence this advantage resulted in better molding, with a better inside appearance in the finished loaf. These advantages all contributed, therefore, to a greater uniformity of production.

From experience in the commercial production of bread, using the Wytase method, there appeared to be a marked improvement in crust color, as well as interior appearance. In addition to the retention of better flavor, the bread appears to have better keeping qualities, which is another decided advantage in its favor.

Instead of bleaching, or artificial ageing of the flour in the flour mill with costly apparatus and delicately balanced control of chemical reagents, the baker now needs only to add a pound or two of the vegetable material, known commercially as Wytase, to the natural flour, milk, sugar, and other ingredients in his dough mixer. Nature does the rest. Fermentation proceeds, removing a little yellowish color from the fat particles in the flour, adding a tang of nutty flavor, and finally there is turned out a baked-in package of "our best and cheapest food."

For years unnumbered bread was just bread, the good old stand-by for hearty appetite, or toasted for the delicate convalescent. No romance about it: we had just taken for granted that it would always be bread. The satisfaction of the wheaty taste, like the natural tang of honey, is one of the few which our palate has preserved unchanged since man first began the cultivation of the soil.

Then slowly we began to recognize a difference in breads, because prices and advertising forced them upon our notice. Like the dairyman, the baker took his responsibility seriously, and brought science and industry to the task of supplying more and better foods in order that the daughter of the house might have more leisure for the pursuits of health and happiness.

So now the modern baker's loaf must chuckle to itself as it steps up into its new position among sophisticated foods, for it has removed at one stroke any objections due to the dark or yellowish color of flour, and has added the advantages of simpler production, better flavor, good keeping qualities, and the pride of a scientific parentage.

The corollary to this application of a natural bleaching action to wheat flour may well be an extension of the principle to other foods, or to commercial processes where undesirable color may be due to plant pigments susceptible to similar enzymatic or catalytic action.

HOW FLOUR IS BLEACHED

By Means of Enzymes

By J. D. VERON
St. Louis, Mo.

THE LATEST development in the field of flour bleaching is the utilization of color-removing enzymes. The first compound containing these enzymes in activated form reached the market in January, 1929, under the trade name of Do-White, a finely-ground, white-colored powder with a pleasing leguminous taste. Do-White is a pure, edible, plant product, containing no added chemical salts. It is partially soluble in water; in a small quantity of water it has a tendency to form a stiff jelly. Its active principle is an enzyme that has the ability to destroy or decolorize the natural, carotinoid pigment of flour. In all wheat this pigmentation is found in varying degrees, being the cause of the creamy yellow to bright yellow color inherent in natural flour. The same pigment, in a much more concentrated form, is the cause of the bright yellow to red color characteristic of carrots.

Digressing, momentarily to the extent of explaining why present-day flour is bleached, with accompanying brief comment on the chemical methods employed, certain facts should be borne in mind.

The carotin in flour is not harmful to mankind, of course. It does not seem to please the eye of the general public, however, and there is no doubt in the minds of the bakers that the consumer wants bread, the crumb of which shall be white. Whiteness gives the impression of purity—a psychological reaction.

Bleached flour is recognized to be a commercial necessity, practically all flour millers striving to give the bakers what they want. But the difficulty lies in furnishing a white flour that holds its strength through storage and maintains its uniformity in the face of varying shop conditions. Flour bleaches naturally in storage, through oxidation by the atmosphere. When flour is bleached at the mill the oxidation is hastened by various potent chemical agents. But, because flour continues to oxidize in storage it ultimately "over-oxidizes"; that is, it deteriorates. This deterioration the miller cannot help, as he cannot dictate when the flour shall be used, or determine what degree of oxidation should be given the flour to suit the baking procedure of the particular customer. Natural bleaching of flour by the atmosphere is very slow. Were all flours to be bleached in this manner, millers would be compelled to invest a tremendous amount of capital in flour storage.

Until recently all flour-bleaching processes were based on rather potent oxidizing agents. Chemicals such as chlorine gas, nitrogen tri-chloride, nitrogen peroxide, and benzoyl peroxide are the oxidizing agents generally employed by flour millers for bleaching flour. Three of these are used in gaseous form, the fourth being a powder. Although ingenious devices have been evolved to mix the bleaching agents uniformly with the flour, it is difficult, if not impossible, to obtain the desired uniformity at all times.

In addition to their bleaching effect, all these bleaching agents effect an alteration in the baking characteristics (volume, grain, and texture) of the flour so treated. The chemicals effect the desired whitening of the color of crumb of the bread, but they also act on the flour protein, which forms the gluten of the dough. It follows that the flour is not only bleached by the bleaching agents but is also, more or less, modified in its other

characteristics. Moderate treatment seems to improve the baking quality of the flour; over-treatment (over-bleaching) may have undesirable effects in terms of its adaptability to yeast-bread production. It is almost impossible to bleach flour chemically at the mill in such manner as to obtain optimum results at the time of actual use. The miller usually has no way of knowing the time when the flour will be used, nor does he ordinarily know how the flour will be handled in the bake shop. These uncertainties, combined with the customary bake-shop practice of adding an additional oxidizing agent in the form of a yeast food, give the flour miller an almost impossible task in deciding the amount of bleach to give the flour. The result is that bake-shop difficulties such as lack of strength, sticky doughs, lowered fermentation tolerance, lack of oven-spring, crumbly texture, open grain, raw taste, grayish crumb color, and pale bloom are often due, at least in part, to the chemical bleaching of the flour.

Yet bleached flour, or its equivalent, is necessary to satisfy the public demand that white bread be actually white. Do-White, which contains bleaching principles that are new in the fields of science and art of baking, seems to answer all the criticisms that have been leveled at flour bleaching. It removes the yellow-colored pigment in the flour when the dough is mixed, without affecting the flour in any other way. Because it is a pure, edible plant product it complies, naturally, with all pure food laws. One-half to one pound of it will completely bleach 100 pounds of unbleached flour when added to the ingredients in the dough mixer like sugar, salt, or any other dough ingredient. Action is very rapid, the dough as it leaves the mixers being already considerably whitened. Bleaching continues throughout the fermentation, until the high heat of the oven during baking kills the enzyme. Like other enzymes, it is more active at high temperatures below its death-point, as in pan-proof, than it is at lower temperatures.

The addition of oxidizing agents, heretofore partly added by the miller (by bleaching) and partly by the baker in the form of yeast foods, is now under the control of one party only—the baker. This new material places the control of flour oxidation definitely in the baker's hands. By buying unbleached flour and using 1 per cent of Do-White, the baker can now for the first time adjust the degree of oxidation of his flour and bread to his exact requirements, by the simple process of adding the proper amount of yeast food to his doughs. This will markedly improve the quality and uniformity of bakery products, and completely eliminate the baking difficulties generally attributed to the chemical bleaching of flour.

We believe the time is approaching when the millers, themselves, will mix Do-White into their mill streams. At present it is, perhaps, too expensive for this use, but we have reason to believe that we can ultimately stimulate the action of the enzyme sufficiently to make it a bleach of the strength demanded by the millers.

In the flour and baking industries the possibilities of enzymatic chemistry have been barely touched. Much work is still to be done in this field. After all, nature is preferable to synthetic chemicals, especially in the realm of food. It is our earnest wish that Do-White may benefit the miller, the baker, and the consuming public.

THE CENSUS—*A Word of Explanation*

From W. M. STEUART, *Director of the Census, comes the following announcement, asking for co-operation in carrying out this great work speedily and accurately:*

THE coming census of the United States will be the most comprehensive statistical compilation ever undertaken in this or any other country. This census will necessitate the employment of over 125,000 people to canvass the dwellings, farms, shops, factories, stores, and other establishments for which data must be obtained. It will cover population, occupations, agriculture, irrigation, drainage, manufactures, mines, quarries, unemployment, and distribution.

In 1790 and 1800 the censuses were confined to the subject of population. Censuses of manufactures were included in 1810 and 1820; and statistics of agriculture, manufactures, and mining have been collected in every decennial census since and including that of 1840. A census of manufactures is now taken every 2 years, and of agriculture every 5 years.

Now for the first time we are to have a census of distribution, which may be defined briefly as a gathering of statistics in regard to wholesale and retail trade. It will show the number of persons employed by merchandising establishments; the principal expenses of such concerns, including rent, interest, and wages paid; the stock of goods on hand Dec. 31, 1929; and the sales of broken down commodity groups, so far as practicable, all classified geographically by kind of distributor, size of establishment, and in other significant combinations. It is estimated that it will be necessary to canvass nearly 2,000,000 establishments.

The government will be greatly assisted in preparing its report on the distributive system of the country if the merchants co-operate by supplying the requisite data promptly and accurately. Each manufacturer is also urged to see to it that the questionnaire of the censuses of manufactures which he has or will presently receive from the government is filled out accurately and mailed at once.

After acceptable returns have been received from all the members of an industry a preliminary report for that industry will be prepared and published. This report will be sent out to all who ask for it.

As the preparation of these preliminary reports requires usually only a day or two after the receipt of the last return, and as multigraphing and mailing consume only about 2 weeks (allowing a week between date of mailing and release date), it is obvious that the date upon which this report will be available depends upon the promptness and accuracy with which the members of the industry send in their reports.

All manufacturers and merchants may be assured that their report will be treated by the government in absolute confidence and will not be disclosed to any person who is not a sworn employee of the Census Bureau.

ANOTHER PROBLEM SOLVED!

Research Well Planned And Well Executed

Eliminates Bacterial Clouding in Olive Brine

By S. HENRY AYERS
H. A. BARNBY
and E. L. VOIGT
Research Laboratories
Glass Container Association

IN A PREVIOUS article it was shown that the clouding of green olive brine could be caused by biological activity.* It was shown that the growth of a mycoderm yeast was responsible for clouding in which relatively large flakes appeared in the brine, some of which floated and some settled to the bottom, causing a white deposit.

It also was pointed out that there is another type of clouding in which the brine becomes uniformly cloudy and a white sediment appears on the green olives where they press against the glass. A white deposit also appears on the bottom of the jar. This second type of clouding is more common than the one previously mentioned; its cause and prevention will be discussed in this paper.

Cause of Clouding—Jars of green olives, received by the Research Laboratories of the Glass Container Association approximately 30 days after packing, showed heavy clouding of the brine and a deposit on the olives and in the bottom of the jar. Microscopic examination of this deposit revealed the presence of large numbers of micro-organisms. Further examination of the brine showed 980,000 living organisms present in each cubic centimeter of brine. Cultural studies showed a practically pure culture of a short, rod-shaped organism, which was found capable of growing in an olive infusion having a high salt content.

Pure cultures of this organism caused typical clouding when inoculated into specially prepared and pasteurized jars of olives. The fact that the same type of organism was found in several commercially packed jars of green olives and that the clouding could be reproduced by pure culture inoculation indicated that the organism isolated was a common cause of the bacterial clouding. Because of the high salt content of olive brine and acid reaction as well, the environmental conditions for the growth of micro-organisms are such as to be restrictive in character. One might expect no growth of the more common forms of bacteria. However, as growth does occur it would be natural to expect a continuation of the types of organisms concerned in the fermentation of the green olive previous to packing.

Green olives for the most part are imported into this country after pickling. They are then removed from the large casks in which they are received from abroad and usually packed in fresh brine. It appears probable that the bacterial clouding of the brine is merely a continued fermentation of incompletely fermented olives. The fact that bacterial clouding does not always occur, merely indicates that some olives are completely fermented when repacked and have reached a condition wherein, after rebrining, fermentation and the bacterial growth that causes clouding cannot continue.

Unless there could be some control over the conditions of fermentation abroad it would be difficult for green olive packers to determine whether or not the olives have been completely fermented. It therefore becomes necessary, if this type of bacterial clouding is to be eliminated, to find means of preventing fermentation in the final container.

Characteristics of the Micro-organism—In order to develop commercial methods for preventing clouding of green olive brine it was necessary to know more of the characteristics of the organism causing the clouding. As the result of many tests the following characteristics were determined. The organism was a short rod capable of growing in the presence of free or reduced oxygen. Sealing under a vacuum therefore would be of no value. The organism grows through a wide range of temperatures; it produces acid from dextrose and cane sugar, other sugars not having been studied. Small quantities

*Ayers, S. H.; Barnby, H. A., and Voigt, E. L., *Glass Container*, Vol. 7, No. 10, 1928.

INOCULATED LABORATORY SAMPLES
showing clouding and the characteristic white rings

of carbon dioxide are formed upon long continued growth. It grows readily in moderately high salt concentration and also in brine with a high acidity, or low pH. The organism is not a spore former and is destroyed at moderately low temperatures.

These observations led to further studies to determine the practicability of stopping the growth and the resultant clouding of olive brine by several methods.

Effect of Salt on Clouding—As it appears to be a common practice to repack green olives in a 7- to 8-per cent brine, the influence of salt concentration, near and in this range, on the growth of the organism was studied. All salt determinations were made by the silver-nitrate method.

In a peptone-extract broth, with dextrose where the organism grows luxuriantly, a 7-per cent salt permits moderate growth. Eight per cent salt permits only scant growth, and 9-per cent salt prevents growth. These results were obtained when the acidity was at pH 6.6, or nearly neutral. Because other tests showed that the salt concentration was more inhibitory to the growth of the organism in the presence of a slight acidity, such as would be present in green olives, it was logical to consider the salt concentration of an olive brine as a means of preventing clouding.

Four jars were packed with green olives and filled with brine, carrying different percentages of salt. The proportion of brine to olives was similar to that of the average commercial pack. The jars were inoculated with a pure culture, in order to assure growth if it could occur at the salt percentages being studied. From the results in Table I it is evident that brines ranging from 6 to 9 per cent of salt did not prevent the growth of the organism, with the resultant clouding. Higher percentages of salt delayed the clouding, which was equally great after 25 days' storage at room temperature.

It will be observed that there is an apparent difference in the effect of salt on the growth of the organism in the peptone-extract broth and in the jars of olives. In this connection it should be remembered that in the broth the salt percentage was made up to definite amounts, which remained constant. In the jars of olives, however, the percentage of salt was in the brine that was added to the olives, and when so added it can change. As a matter of fact, tests showed that when a 7-per cent brine was used to pack olives the salt concentration after 5 months' storage became 5.9 per cent. An 8-per cent brine was reduced to 6.3 in one jar and to 7.7 in another. Change in the salt concentration of the brine is to be expected naturally, as the salt content of the brine from which the olives are taken for repacking varies in concentration. Therefore, aside from the difficulty of always reaching a definite concentration of salt in the olive brine in the final container, one high enough to prevent bacterial growth and clouding would make the olives too salty for the taste of the average consumer.

Although theoretically possible to prevent clouding by the salt content of the brine, it is not commercially feasible.

Effect of Heat in Preventing Clouding—When trouble in a packed product is caused by bacterial growth, the product is usually given heat treatment if such action be possible. From the results of thermal death point studies of the organisms causing clouding, it appears that low heat treatment should prevent clouding.

The heat treatment required to kill the organism was determined by heating in tubes of sterile broth, which had been inoculated with 4 drops of the pure culture. The tubes were then heated to the temperatures shown in Table II and held for 5 minutes. Following this, they were immediately cooled to room temperature within 2 minutes. From the results it will be seen that the organism causing clouding was destroyed by 5-minutes' heating at 135° F.

With this fact in mind, experiments were made to determine the time necessary to so process olives in jars as to destroy the organisms causing clouding.

In these tests 9 olives were packed in 6-ounce jars and covered with approximately 50 cubic centimeters of brine containing 7-per cent salt. In order to insure growth, if the organisms were not destroyed, 0.5-per cent dextrose was added and each jar inoculated before sealing with a pure culture of the organism causing clouding. The jars were packed with olives and brine at room temperature and heated in a water bath. The temperature was determined by inserting a thermometer in a control jar packed the same as those in the test. About 12 minutes was required to heat the brine to 140° F.

From the results in Table III it appears evident that if the temperature *in the brine* is raised to 140° F. and held for 5 minutes the organisms will be destroyed and clouding prevented. Heating green olives to these low temperatures, as far as the experiments indicate, does not in any way affect the appearance, flavor, or texture of the olive.

Processing green olives by heating to low temperatures in the sealed container offers a commercial method for the prevention of clouding of the brine, when it is due to biological causes. It is not recommended that the packer try to effect proper heating by filling the containers with hot brine. Tests have shown that, even when the brine is at 200° F., the temperature in the olive-filled jar drops so rapidly that it does not give effective heating.

The photograph shows clearly the appearance of jars of olives with cloudy brine. The tall jar on page 61 is a commercial sample. The white ring on the side of each olive where it presses against the glass owes its origin to the fact that the brine first becomes uniformly cloudy because of the growth of bacteria. These organisms then settle, becoming lodged on the olives where they are in contact with the glass. The great mass of growth settles to the bottom, forming a heavy sediment. The two small jars, similarly contaminated, were packed in the laboratory and the clouding produced by inoculation of pure cultures of the organism causing clouding. The two jars on page 63 were inoculated in the same manner at the same time but were given a heat treat-

ment. No clouding is observed because the organism was destroyed in the heating.

Effect of Acidity in Preventing Clouding—Although a heating process may be used to prevent clouding of olives due to biological causes, it is not unlikely that some olive packers would prefer other means if such were available. During the study of the growth characteristics of the organism causing the clouding of olive brine, the acidity limits necessary to prevent growth also were determined. The culture grew well when inoculated into a dextrose broth medium with an acidity of pH 3.6. However, when the acidity was brought to pH 3.0 growth was prevented.

This would lead to the thought that if the pH of the brine were brought to 3.0 or lower by the addition of acid, possibly growth of the organism would be prevented and there would be no clouding. It was of course realized that there would be some "buffering" action due to the olives' taking up some of the acidity and for this reason the pH of the brine was adjusted, by the addition of acid, to values lower than had been found necessary in the pure culture studies. That is, more acid was used in the brine than was theoretically necessary to prevent growth in a medium where the pH would not change.

SAMPLES SIMILARLY INOCULATED, in which heat treatment has destroyed the organisms

Table I—Effect of Salt on Clouding of Brine With Green Olives

Per Cent Salt in Brine	Clouding After 11 Days	Clouding After 25 Days
6	+ + +	+ + +
7	+	+ + +
8	—	+ + +
9	—	+ + +

— No growth.
+ Slight growth, giving faint clouding.
+ + + Heavy growth, giving heavy clouding.

Table II—Temperature Required to Destroy Bacteria Causing Clouding

Temperature, Deg. F.	Growth of Bacteria
120	+
125	+
130	+
135	—
140	—

— No growth.
+ Slight growth, giving faint clouding.

Table III—Olives Heated in Jars

Heating Conditions	Clouding
1. Heated to 140° F., then air cooled	1 jar —, 1 jar +
2. Heated to 140° F., then cooled in water	+
3. Heated to 140° F.; held 5 minutes, air cooled	—
4. Heated to 140° F.; held 5 minutes, cooled in water	—
Control—not heated.	†

— No growth.
+ Slight growth, giving faint clouding.

Table IV—Buffering Action of Olives

Jar	When Packed pH	Time Clouding Appears, Days	After 5 Months' Storage, pH
B	6.6	14	3.98
C	2.92	17	4.27
D	2.50	17	4.00

Table V—Percentage of Acid Necessary to Maintain a Hydrogen-Ion Concentration of pH 3.0 in Olives

Acetic			Citric			Lactic			
Per Cent Acid in Brine	pH When Fresh	pH After 24 Hr.	pH When Fresh	pH After 24 Hr.	pH After 5 Days	Per Cent Acid in Brine	pH When Fresh	pH After 24 Hrs.	pH After 5 Days
0.50	2.7	3.75	1.9	3.1	3.15	0.50	2.2	3.21	2.80
0.75	2.6	3.63	1.85	3.05	3.00	0.75	2.13	2.95	2.30
1.50	2.35	3.30	....	....	....	....	....	....	....

Table VI—Effect of Organic Acids in Preventing Clouding of Olive Brine

Percentage of Acid in Brine	Clouding Appears, Days	After 6 Months' Storage
Acetic		
0.5	61	Heavy clouding
0.75	..	No clouding
1.50	..	No clouding
Citric		
0.3	53	Moderate clouding
0.5	..	No clouding
0.75	..	No clouding
Lactic		
0.5	..	No clouding
0.75	..	No clouding

The results of the experiments in Table IV show that olives have considerable buffering action and lower the acidity of the brine, or in other words increase the pH. Three jars of olives were packed with 8-per cent salt brine to which 0.5-per cent dextrose was added to make conditions most suitable for growth. No acid was added to the brine in one jar, enough acid (citric) having been added to the brine in the other jars to bring the pH to 2.92 and 2.50 respectively. Before sealing, the jars were all inoculated with pure cultures of the organism causing clouding.

It will be observed from the table that clouding of the brine appeared in from 14 to 17 days. In other words, the addition of acid to the brine, in quantities sufficient to bring the pH lower than that necessary to check growth in a dextrose broth medium, had no appreciable effect in preventing clouding.

The jars were held for 5 months and the pH was then determined. Examination of Table IV shows that the acidity of the brine in jars C and D had decreased during the storage period. The increase in pH, representing a decrease in acidity took place despite the acid production, which was going on because of the growth of the organism. (This acid fermentation is indicated by the decrease in pH from 6.6 to 3.98 in jar B.)

These results show clearly that olives exert a buffering action, in which the acidity of the brine is reduced. It was therefore evident that not only should the brine be made sufficiently acid to bring the pH to about 3 but there should be sufficient acid in the brine to maintain the acidity at about this point if bacterial growth and clouding of the brine are to be prevented by acidity control.

In order to determine the additional quantity of acid necessary to maintain the pH at or near the desired point of 3, the following tests were conducted. It was determined that in the average pack there is about 85 grams of olives to 58 cubic centimeters of brine. Using this ratio of solids to liquor, several jars were then prepared in which finely ground and crushed olive meat was placed in 8-per cent brine. Because of the difference in the dissociation of the acids, acetic, citric, and lactic were used. Varying percentages of these acids were added to the brine in the jars with ground olive.

The object of crushing the olive was to obtain as

quickly as possible the action of the olive on the acidity. After preparing the samples, the hydrogen-ion concentration was immediately determined in the olive infusion, then again after 24 hours' storage at room temperature, and in some cases after 5 days.

From the results of these tests, shown in Table V, it will be seen that 0.5 per cent of acetic acid in the brine did not maintain the pH at or near the desired point of pH 3.0. However, 0.5 per cent of citric and of lactic acid maintained the pH in the desired zone for 5 days, indicating that this percentage of these acids would overcome the buffering action of the olive.

In order to apply the results of these tests to green olives, a series of jars were packed with 8-per cent brine, containing varying percentages of the three organic acids. The results in Table VI show that clouding was not prevented when olives were packed in a brine containing 0.5 per cent of acetic acid. Higher percentages of this acid were effective, although they gave a more distinctly acid taste to the olives than might be desirable to the average consumer.

With citric acid, 0.3 per cent did not stop clouding but 0.5 and 0.75 per cent were effective. Lactic acid in the concentration of 0.5 per cent stopped the growth of the organism and prevented clouding of the brine.

From these results it appears that the clouding of olive brine can be prevented by properly acidifying the brine. For green olive packing Cruess (Cruess, W. V., *Western Canner & Packer,* Vol. 17, No. 1, 1925) has recommended the use of 0.3-per cent acetic acid or 0.5-per cent lactic acid in the brine. In these studies 0.5-per cent acetic acid was not found to prevent clouding, although that amount of lactic acid was effective. In commercial practice the use of 0.5-per cent lactic acid in an 8-per cent salt brine is suggested for best results.

Olive Brine Color—It appears that the bacterial clouding of olive brine comes from what may be considered a continued fermentation of that which takes place during the pickling process. When this fermentation does not progress to the point at which fermentative activity ceases, it continues in the jars after the olives are repacked in fresh brine, thereby causing clouding.

When this clouding is prevented either by heat treatment or by acidifying the brine there is a tendency upon long storage for the brine in the jars to change from a light yellow color to a brownish yellow. This change takes place gradually during storage, the tendency to color change in the brine being not very noticeable during a period of 6 months, even though for 3 of those months the temperatures ranged from 80° to 90° F.

The tendency toward browning of the brine was greater when acetic acid was used for acidifying the brine than with citric or lactic acid. Lactic acid held the brine color best, which is another point in favor of its use for preventing brine clouding.

Atmospheric oxygen seems to accelerate the tendency toward color change in the brine. For this reason vacuum sealing of green olives is advisable, although such sealing has no effect in preventing clouding by the growth of the micro-organism described in this paper. However, vacuum sealing does prevent the clouding of olive brine caused by the growth of the mycoderm yeast described in a previous paper.

The tendency of olive brine to darken appears to be of no commercial importance because of the relatively quick turnover of green olives. Unless shelf storage of a year or more is required the packer need not give this matter further consideration.

Conclusions—In the pickling of green olives a fermentation takes place in which lactic acid is formed. When this fermentation proceeds properly at suitable temperatures it reaches a stage where the environmental conditions prevent further development of the micro-organisms causing the fermentation. Because most green olives are imported the packer has little or no control over the conditions during the period of fermentation. As received by the packer this fermentation may or may not be completed. If it is not completed it will continue after repacking in fresh brine in the jars. This continued fermentation causes the form of cloudy brine described in this paper.

If it is practicable for the packer to place the green olives in suitable brine and hold at suitable temperatures it may be possible to complete the fermentation before packing. Under such conditions it would be desirable to filter the brine in which the olives are undergoing fermentation in order to retain the acidity that is developed, as well as extracted flavors which otherwise would be lost. This would also result in producing a more yellow green olive, if such is desired.

When it is not possible to control the fermentation during pickling or for the packer to complete it before placing the olives in the final containers, two methods are available for preventing the clouding of the olive brine. One is by the use of heat in which green olives after being packed in the jars are heated just enough to destroy the organisms which grow in the brine and cause clouding. To accomplish this it is necessary merely to bring the temperature of the brine *in the jar* to 140° F. holding it at that point for 5 minutes.

Another way to prevent this form of clouding is to prevent the growth of the organism by acidifying the brine with an organic acid. The best method for this appears to be the use of an 8-per cent salt brine, containing 0.5 per cent of lactic acid. This amount of acid maintains the acidity of the brine at a pH sufficiently low to prevent the growth that causes clouding. Of course, if filtered brine is used it will already contain lactic acid. In this case the percentage should be at least 0.5 per cent and, if not, a sufficient amount of acid should be added to bring it to this percentage. This may not, however, be sufficient because the buffer action will be different and the actual amount of lactic acid required to check the fermentation may have to be determined.

These methods for preventing the white clouding of olive brine will prove effective unless other micro-organisms are encountered, with characteristics differing from those found in these studies.

Summary

1. The cause of the white clouding of green olive brine by the growth of bacteria is discussed.

2. Clouding cannot be prevented by the salt content of the brine.

3. Clouding can be prevented by destroying the organism by low-heat processing.

4. Growth of the organism and the resultant clouding of the brine can be prevented by acidifying the brine with organic acids.

5. The methods of preventing clouding of the brine are established on the basis of the type of organism found in the studies. Other micro-organisms may, of course, be found that do not respond to these preventive methods.

By **HARRY STINER**
National Biscuit Company

The greatest care to produce perfect goods that are insect-free may be completely wasted by packing the food in cartons that contain insect eggs, or by shipping the goods into infested places without protecting them by packing in insect-proof containers or replacing the air by an inert gas.

•

AVOIDING INFESTATION OF GOODS

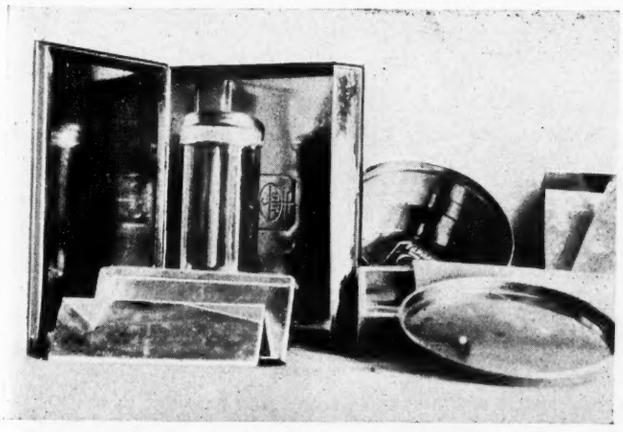
That Have Left the Factory

Why proper packaging must be coupled with fumigation

IT IS a far cry from the one-man production of our forefathers to a modern food manufacturing center of today. Where everything was once consumed near its origin, great quantities, as well as varieties, are today prepared under one roof, and distributed in containers to thousands of homes throughout the world. Quantity production, under scientific control, has increased the variety of foods obtainable during all seasons of the year, and has greatly lessened household drudgery. Coincident with the development of this huge industry, however, have appeared many features—insignificant in the methods of yesteryear—which frequently are serious problems with the enormous organizations of today.

One of the principal and most costly problems arising in the production, preparation, and marketing of foods is "pest control." Particularly is this evident with insect pests and their allies—mites. Several thousand different species of these animals exist that directly attack our foods; and were it not for the desperate, though often seemingly hopeless, battle which man is waging against them constantly they would surely predominate in time.

TYPES OF round and rectangular metal containers that are used for packaged goods



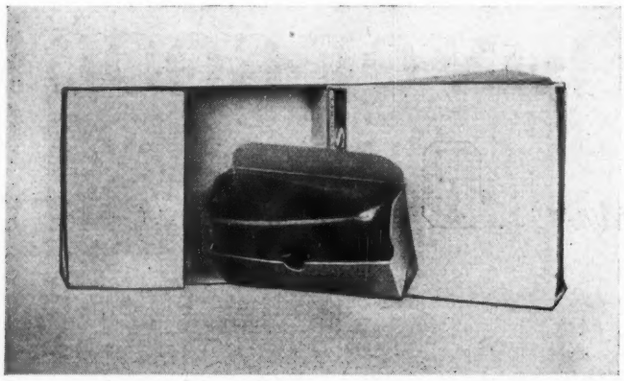
All of our foods are subject to destruction by pests during every stage of their growth, storage, and preparation. Throughout their development, whether plants or animals, they must be protected with insecticides, fungicides, or fumigants; while in storage, they usually are heated or fumigated at intervals, or held in cold storage. Later as food materials, passing through the various processes of preparation in a factory, they are at some point often sterilized by sufficient heat to destroy all insect life. However, such foods, or portions of them that are not heated, are always infested with at least a few insects or eggs when packed. Regardless of the efforts made to maintain an insect-free factory it seems that one or more individuals of the excluded millions outside, will occasionally get in.

Insects infesting factories are small in most cases and prefer the darkness or semi-darkness for their egg laying. They fly about, generally unobserved, placing their tiny, almost microscopic eggs on conveyors, containers, exposed foods, or wherever their instinct guides them. The smallness of the eggs easily prevents their detection while the materials are being packed. Consequently they are unwittingly sent out for distribution to the various markets, there to hatch, make wormy "comebacks," lose customers, and, last but not least, increase production costs. Much study and progress in field pest control, as well as storage pest control, have been made in the last few years, and many factories and mills, realizing its importance, have so reduced their "bad goods returns," by employing one or more of the various approved methods, that their losses have become almost negligible.

Metal Containers—Tin cans decorate the front and back doors of nearly every city and hamlet the world over. Their use is confined largely to liquid, or semi-liquid food materials, which are generally heated sufficiently to stop all insect life, either before or after seal-

ing. If the foods are not sterilized by heat, some other method must be used to guarantee their future wholesomeness and, as conditions vary greatly with both materials and containers, several suitable methods have been evolved.

Materials placed in round metal containers and sealed under a high vacuum seldom develop an infestation, even though insect eggs were on the goods when they were packed. Insects need oxygen to sustain life just as surely as the higher animals do, and when oxygen is removed by evacuation their growth must eventually cease. But the quantity of air consumed by a "worm" is comparatively small, and considerable damage may be done by a few larvas before the supply of oxygen is exhausted, if only a partial vacuum is employed. Round



LIGHTWEIGHT OPEN CARTONS are used for carrying light materials that are quickly consumed

metal containers, therefore, should always be sealed under as high a vacuum as they will withstand without collapsing, particularly, when uncooked foods are put in them.

Rectangular metal containers for dry or semi-dry foods are becoming more popular among manufacturers as their value becomes evident. But if merely covered with a tight lid they protect the materials only from outside attack, and furnish no safeguard against the development of insect eggs that might be on the foods when packed in them.

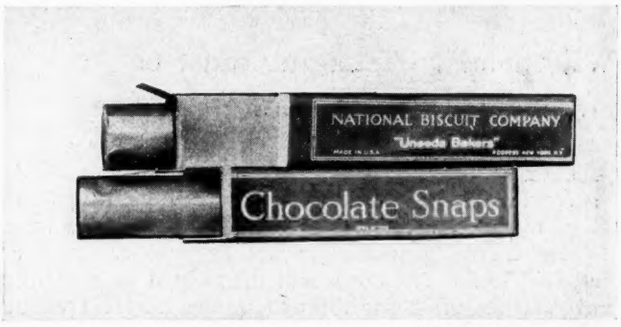
Sealing this type of container gives very few advantages over the container with a tight lid only, except as a protection against moisture, but it can be made practically pestproof by replacing the air with some inert gas, such as carbon dioxide or nitrogen, just before sealing. By this method, the oxygen necessary to life is replaced with a non-poisonous material which inhibits the growth of both insects and micro-organisms.

The most satisfactory method of replacing the air in a metal container by another gas is obtained by the aid of vacuum. The material is first put in and the lid is soldered or sealed in place. A small hole is left in the top or bottom to be later closed with a drop of solder. The containers are placed in an airtight chamber, capable of withstanding an outside pressure of 14 pounds per square inch. A vacuum, preferably of 29½ mercurial inches, is then created in the chamber, and relieved by admitting the kind of gas desired. With this degree of vacuum over 97 per cent of the air is drawn out of each container through the small vent hole, and is then replaced with the inert gas. These holes are closed with solder as soon as the containers are removed from the chamber and, if properly sealed, the contents should remain sterile until opened. A large variety of foods are now being marketed in this manner, especially those materials that will not permit heating just previous to packing and those that are to be marketed in humid territories.

Paper Cartons—Many articles are sold in paper cartons. These containers vary greatly in kind as well as in quality. When the foods to be packaged will not be damaged by insect attack they usually are packed in cartons just strong enough to hold their contents until consumed. Also some foods—even those that are subject to insect infestation—are marketed in this manner, quick turnover being depended upon to avoid trouble.

This light-weight, comparatively open type of paper container shows a considerable saving in many ways, especially when the goods are disposed of on the intended schedule, and enjoys the good fortune of passing by the local distributors in stores reasonably free of other infested articles. On the other hand, the amount of trouble that some rather neglected neighborhood grocery can start by storing an oversupply of these cartons with his already contaminated stock is often enough to cancel all savings for a considerable period. The growing tendency among most manufacturers, therefore, is not only to increase the strength of this type of container, but to seal all its joints tightly.

Normally, paper cartons are not proof against moisture, although their efficacy in this respect can be greatly in-



METHODS OF SEALING COOKIES in waxed paper. Lower: double sealed; upper: triple sealed

creased by using materials treated with wax or some other waterproofing. Waxed paper liners, especially if separately sealed, will do much in protecting the contents from moisture as well as insect invasion.

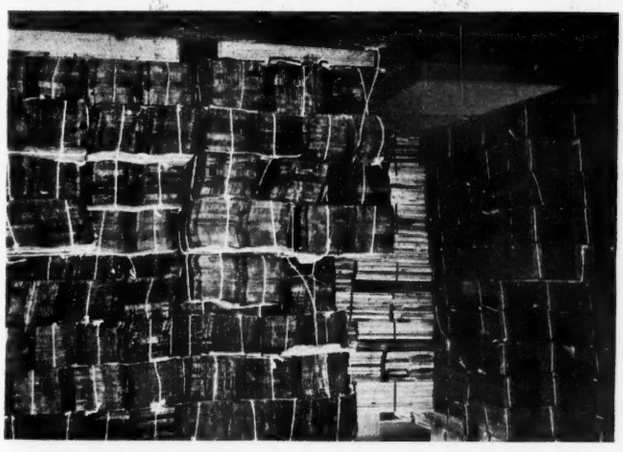
When using either plain or moisture-proof cartons, sealing always is necessary to safeguard the interior against outside insect attack; and even when this is done —as in the case of metal containers—there is no assurance the interior will not develop an infestation from eggs that were packed with the materials. Furthermore, the chances of future contamination are greater in paper cartons than in metal containers, because of the inclination of some insects to lay their eggs on the empty carton stock. The effects of this insect habit are constantly appearing in many branches of the food industry, but perhaps due to the seeming improbability of its occurrence, they are not always recognized.

Certain storage moths and beetles have the habit of laying a part of their bountiful supply of eggs on various objects, some of which would require more than ordinary animal instinct to recognize a possible food supply for future generations. Many of such eggs perish after hatching, for lack of food; but those that happen to be placed on the inside of a carton that is packed before they hatch will awake to find their banquet waiting.

Fumigation—The only generally approved system yet developed for checking future infestation within a paper package is fumigation with some gas toxic to insects. Due to its comparative cheapness and the broad range of its values, fumigation, in one or more of its various methods, is rapidly gaining recognition among progressive American food manufacturers. When the materials are properly sterilized before packing, it is quite possible to treat the cartons separately and just previous to filling; but the most popular and generally the more economical practice is to pack, seal, and crate the cartons, then fumigate them just before shipping. If the goods are to be held at the factory for some time it is, of course, advisable to treat them before storing.

Fumigation may be classified in two rather broad methods: atmospheric and vacuum.

Atmospheric fumigation is the term generally used when the materials are placed in some form of a room or container at normal air pressure, in which a predetermined quantity of gas or volatile liquid is introduced. All sides of the room must be as nearly airtight as it is practicable to make them and sufficient time must be given for the gas to permeate thoroughly every part of the material to be treated. Only a short time is required for the gas to diffuse throughout all open spaces, but 24 hours, or even more, often is required for it to penetrate some of the more dense articles such as thoroughly sealed cartons, made of thick cardboard, or soft, tightly-packed foods. The moisture-proofing with which some



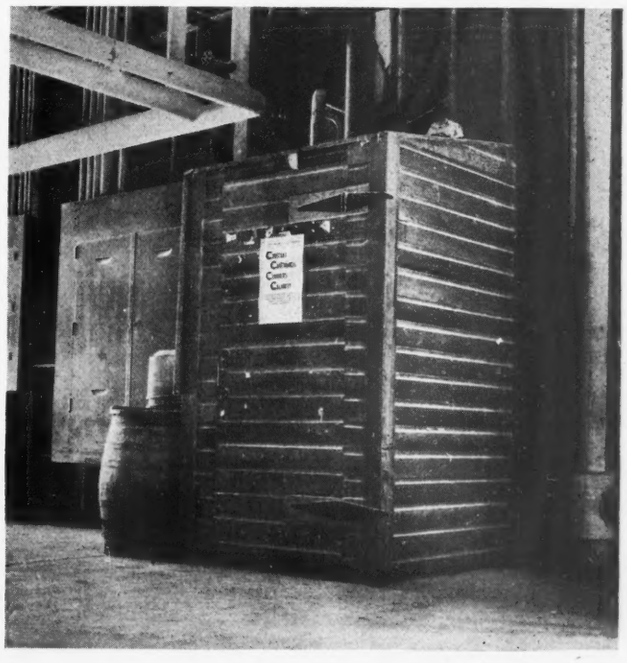
STORED CARTON STOCK infested with insect eggs that later hatch out when the cartons are filled, unless they have been fumigated

paper cartons are impregnated also increases the time necessary for treating.

Gases for Atmospheric Fumigation—The two gases most commonly used today for atmospheric fumigation are carbon disulphide or some form of hydrocyanic acid. As is known, each of these gases has its faults. Carbon disulphide is explosive at all concentrations suitable for fumigating, and must be protected from hot steam pipes, electric sparks, or open fires of any kind. It also has a strong affinity for oils, which prohibits its use with several foods. Hydrocyanic acid, in any form, either gaseous or liquid, is as deadly to man as to insects. Furthermore, it is adsorbed some by the materials fumigated and, though the amount retained by the foods is seldom sufficient to cause any alarm, a careless combination of an excessive dosage with insufficient aeration could produce quite serious consequences.

Another gas, still in the experimental stage, and known as ethylene oxide, has created considerable interest of late. This material was first introduced by R. T. Cotton and R. C. Roark, of the U. S. Department of Agriculture, and has later been subjected to the investigations of several others. So far this gas is reported as being toxic to insects in concentrations of 2 pounds per 1,000 cubic feet of total air space in the empty fumigating chamber, and is not considered seriously poisonous to man. It is inflammable at high concentrations, but is said to be safe at fumigating strengths.

Vacuum Fumigation—Atmospheric fumigation has been used successfully for many years, but with the increasing speed demanded of factory production today the loss of the time required to secure a thorough gas pene-



A SMALL atmospheric fumigating chamber

tration into the more dense materials is often considered equal to, or greater than, all benefits derived from the treatment. To overcome this fault of atmospheric fumigation a system of fumigation with the aid of vacuum has been developed, and it is considered very successful wherever adapted.

It is possible with a vacuum fumigator to do in less than two hours what would require 24 or 48 hours by the atmospheric method. This is brought about by the influence of the vacuum. The apparatus consists essentially of a steel cylinder, of variable length, fitted with an airtight door at one or both ends. A vacuum pump also is necessary, and it should be capable of removing at least 90 per cent of the air in the tank—or creating a vacuum of 27 inches of mercury. Special applicators are used for each kind of gas.

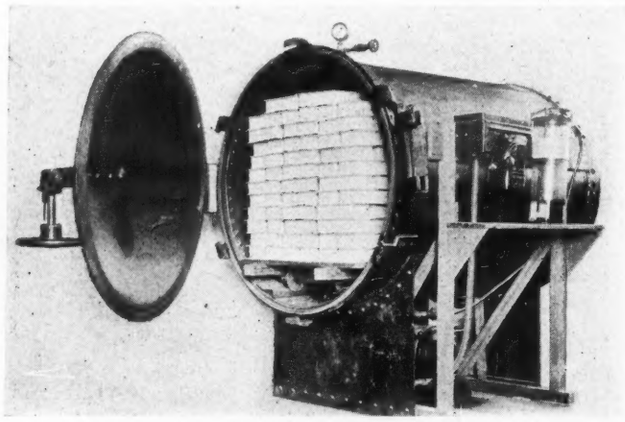
All foodstuffs are composed of solids, moisture, and air, and when a vacuum is created around them a goodly portion of the air is removed; especially is this true of all cavities large enough to hold the smallest insect. Therefore when the vacuum is released by a toxic gas the fumigant will be forced directly into all of these evacuated orifices, under a pressure of 13 pounds per square inch, thus reaching their innermost depths without delay.

In addition to the time saved over atmospheric fumigation, the vacuum method has made the sterilization of

sealed and crated cartons more thorough and permits the manufacturer to regulate the quantity of gas that is left in the package after treating—a feature often considered quite desirable.

Factories manufacturing a variety of products often find a vacuum fumigation outfit useful in several ways. They can fumigate any or all of their raw materials; their finished goods can be treated for storage or shipment; and sealed metal containers can be filled with any preserving gas desired. Also various manufactured foods may require some drying before being packed, and this process is greatly hastened by vacuum.

Instructions for operating a vacuum fumigator always accompany the machine. Roughly speaking, they are as follows: The materials are placed in the tank, and the



TREATING GOODS, packed in insect-proof containers, by vacuum fumigation. One of the first in the country, this fumigator has been in use since 1919

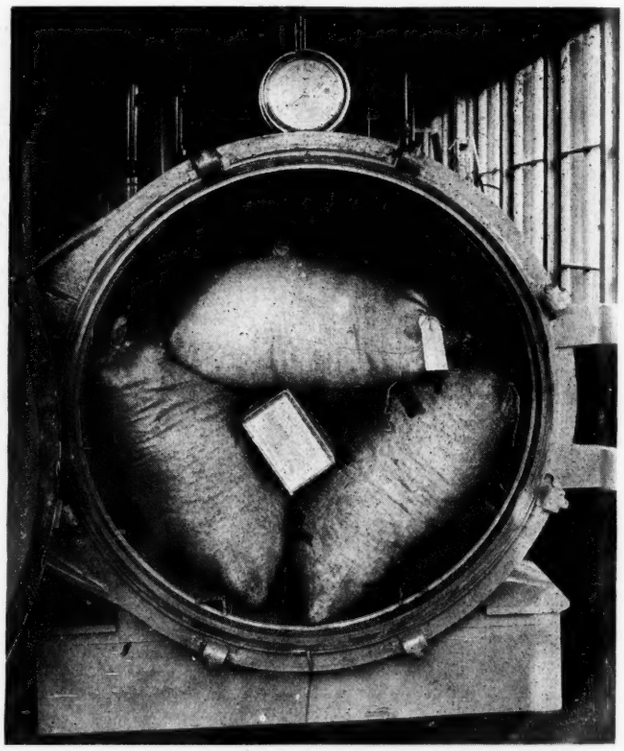
door is closed. The air is then exhausted to the proper vacuum; the vacuum is relieved with the desired gas, or gases, in predetermined amounts. At the end of one hour, more or less, another vacuum is created within the tank—thus removing the gases—which is then relieved with fresh air. The treated materials can be taken out at once, and the operation repeated.

Gases for Vacuum Fumigation—Cyanide gases are seldom used in vacuum fumigation of foods, because of the necessary increased dosage per 1,000 cubic feet, which, of course, increases the relative quantity that will be deposited on the food materials.

Carbon disulphide has the same effect on certain oils in vacuum fumigation as in "atmospheric" fumigation; however, it is possible to remove its most undesirable feature—explosiveness—by the introduction of some inert gas, such as carbon dioxide or nitrogen, together with the carbon disulphide gas. This admixture in no way changes the toxic value of the carbon disulphide, for the percentage remains the same; but it fills all remaining space, thus eliminating the oxygen that is necessary to make carbon disulphide gas explosive.

Very little can be said for or against ethylene oxide gas in connection with vacuum fumigation, for insufficient work has been done with it. Due to the shorter period of exposure in vacuum fumigation, other gases require an increase in dosage of from two to ten fold, to compensate for the decreased exposure. Partial tests made thus far seem to indicate that this also will be necessary with ethylene oxide. At its present cost, and because of its explosiveness in more concentrated mixtures, it cannot be recommended for use with vacuum at present.

Costs—One of the first and most natural questions asked in all lines of business when some form of improvement is suggested is, "will this system justify the expense involved?" It is impossible to formulate cost data that will fit all conditions, either for equipment or efficiency. Labor conditions vary with the locality and also with the factory, and space often is at a premium. It is always first necessary to know the cubical content of the factory's requirements for the apparatus to be installed, or at least the peak demand. Consideration must next be given to the factory space required, or to new buildings that may become necessary. The kind of material to be treated has much to do with the type of equipment and generally determines the kind of gas to use; also labor is required for handling the materials as well as operating the fumigator. The size of a treating plant is determined by the demand upon it, and in turn the price is determined by the size and type. Labor will amount to but little more than the moving of the materials to and from the fumigator; and power cost usually is comparatively small or nothing. Gas cost figures, while generally not high, are variable with the kind of gas. The



CONSIDERABLE SPACE IS WASTED when packages do not economically fit the fumigator. This installation— a 4x10-foot unit, at the State Insectary, Sacramento, Calif.—is loaded with almonds

shape of the goods may be such as to leave many open spaces or they may be so loose and porous that they will have only a slight displacement value. Leaks, here and there, are cumulative in their effect and necessitate a heavier dosage to compensate for them. Also temperature, when below 60° F., generally calls for an increased dosage of fumigant.

Pest-control cost figures often appear large in the aggregate mainly because they represent an undesirable feature, but when calculated on unit output the cost invariably is small. Also these expenses generally are offset many times by the reduction of "come-backs," the elimination of waste, the enhancement of good-will toward the manufacturer, and in his satisfaction in being able to back up his advertising with the goods.

RECONSTRUCTING IDLE BUILDINGS

For Food Manufacture

By HORTON R. PARKER
Technical Service Company
New York City

Fig. 1—THE BUILDING as it was before reconstruction. There are many like it scattered throughout the country

TO ATTEMPT to describe any one type of building as ideal for an industry as large and as diversified as the food industry would be inconsistent. Each branch of the industry will have its peculiar housing problems. However, there are a number of idle plants scattered throughout this country which could very well be adapted to the food industry. Small savings in housing each industry would be of considerable value if reflected throughout the entire group. The industry under consideration would be benefited as well as the locality in which the empty factory was located.

As an indication of the building costs involved, the following figures are given for a reconstruction job just completed in a small town located within 100 miles of New York City. The industry seeking a location was typical of the large number of small food industries in this country in which the labor problem is not serious (less than 10 people), and the finished product is put out in small packages which are sold through parcel post or express service to jobbers and distributors throughout the country. A foreign service is contemplated which will be served from the same location.

If possible, cheap electric power and a low-priced supply of pure water was desired. Such requirements could be met by any number of small towns throughout the states of New York and New Jersey.

A building was chosen which is a unit of a much larger textile plant. Electric power is furnished by the landlord at a very reasonable rate from turbines run by a small stream flowing through the property. This same stream supplies the water, which is put through sand filters, chlorinated, and sold to the tenant at a fair contract rate. Water for condenser purposes is supplied from the flumes to the turbines. It was found cheaper to buy the water from the 4-inch pipe line running by the building than to install a separate piping and pumping system.

Fig. 1 shows an exterior view of the building at the time it was leased from the owner at an agreed upon rate per square foot. The main building is 126 feet 9 inches x 43 feet 10 inches inside dimensions with an average ceiling height to the trusses of 19 feet. An addition of 40 feet 3 inches x 40 feet 5 inches adjoins the main structure and will be used as a general store room. The interior of 17,000 square feet of wall area was given a double coat of white, cold-water paint at the following figures:

4 Men 10 days	$150.00
Material	100.00
Total cost	$250.00

Cost per square foot, 1½ cents.

The painters also removed a number of large beams from the roof trusses. A small spray apparatus operated by a hand pump was used. The mixing was done in a barrel with a small pump attached. Fig. 2 gives a view of the interior of the building after the paint was applied. The building had been previously used as a chemical plant and considerable preliminary work was necessary

Fig. 2—AN INTERIOR VIEW, after thorough cleaning and painting and before the installation of partitions and machinery

in order to remove the traces of the chemicals from walls and floors.

The owner's labor, shops and supervision were used whenever possible. It was found necessary to augment these forces from time to time, but in general no outside labor was employed. This method introduced the plant machinists and pipe fitters into the construction of the new plant and as they will be responsible for maintenance a greater efficiency will be received from them at a later period. Packing, valves, piping, and the like were ordered through the owner's storeroom and an effort was made to use the same type of equipment in order to permit a more economical operation of the stock room. The following hourly labor scale prevailed at the plant in question:

Bricklayers	$0.83
Bricklayers helper	.50
Machinists	.70
Carpenters	.70
Pipe fitters	.55
Pipe fitters helper	.45
Painters	.50
Yard labor	.51

An item of 2½ per cent of the net labor was included for the use of the tools and plant equipment. Costs were based on labor and material changes plus liability insurance for the labor. The total cost to the tenant was the aggregate based on the foregoing items, plus 10 per cent.

Four foundation piers of 7¼ yards each were set upon an 8-inch reinforced mat, which was placed 26 inches below the old floor level. These piers were 5 feet 6 inches above the floor level. It was found necessary to fill up and bridge over some old flues and furnace settings. For this job 500 square feet of forms were used at a cost of $50 for labor and $50 for material, or a total cost of 20 cents a square foot. One form was built that was made up with bolts and used for the entire group of piers. In the concrete gang 11 men were used and one form of 7¼ yards was poured in about 4 hours. A 1:2:4 mixture of concrete was used with a 1½-inch crushed rock aggregate. Material charges were as follows: Cement, 68 cents per 94-pound sack; sand, $2.25 a cubic yard; crushed stone, $2.66 a cubic yard delivered. At these figures the labor cost was $4 and the material cost $9.50 a yard, or a total cost of $13.50 a cubic yard.

The old 3-inch cinder concrete floor was ripped up and a 1:2½:5 concrete floor 4 inches thick laid upon the old cinder fill at a cost of 17 cents a square foot. A total of 2,250 square feet was laid.

A brick vault 15x18 feet was built into one end of the storeroom. This vault was 8 feet high at one end and 11 feet high at the wall. Old bricks were used to make a 9-inch wall at a cost of $8 a thousand. These were set in a cement mortar to give added strength. A roof of 3-inch concrete was put on by using 2,265 pounds of old, 25-pound industrial rails, at a cost of $28, spaced 18 inches and covered with expanded metal. This room was installed at the following costs by one bricklayer and helper working intermittently at the job:

4,000 bricks	$32.00
Cement mortar	15.00
150 feet 16-pound rails	28.00
270 square feet expanded metal	14.00
Labor	180.00
Total	$269.00

Cost per square foot of wall, 24 cents, and of roof 58 cents.

The old floor of the building was used.

A 6-inch, hollow tile sewer was put in about 2 feet below the floor. The total cost of this job of approximately 100 feet was $12 for labor and $20 for material, or 32 cents a running foot.

Offices and laboratories as shown in Fig. 3 were made of Sheet Rock in sheets 4x7 feet at a material cost of 4½ cents a square foot. Charges for this job were as shown in the following table:

Sheet Rock	$60.00
460 feet Y.P. feet old 1x8-inch pine	14.00
415 square feet ⅜-inch H.G. maple flooring	68.00
4 windows (20x3 feet)	14.00
7 doors	10.00
1,000 feet 2x4-inch fir	50.00
300 feet 4x4-inch fir	30.00
Carpenters	150.00
Total cost of 186 feet of partition	$396.00

Cost per square foot, 17 cents; cost per running foot, $1.25.

In building platforms, 408 square feet [7,020 pounds] of ⅜-inch Diamond Plate was laid on a superstructure of 4-inch and 6-inch I-beams 9 feet 6 inches high, costs for which were:

3,500 pounds 4- and 6-inch I-beams	$105.00
408 square feet ⅜-inch Diamond Plate	367.00
15 3-inch pipe Cols—9 feet long	70.00
Machine shop work	30.00
Erection of platform	32.00
Total cost	$604.00
Cost per square foot	$1.50

Heating coils in the building were straightened and used, thus eliminating one expense item. Vapor-proof globes were installed and the old wiring repaired wherever needed. The slate roof needed but few repairs to put it in good shape.

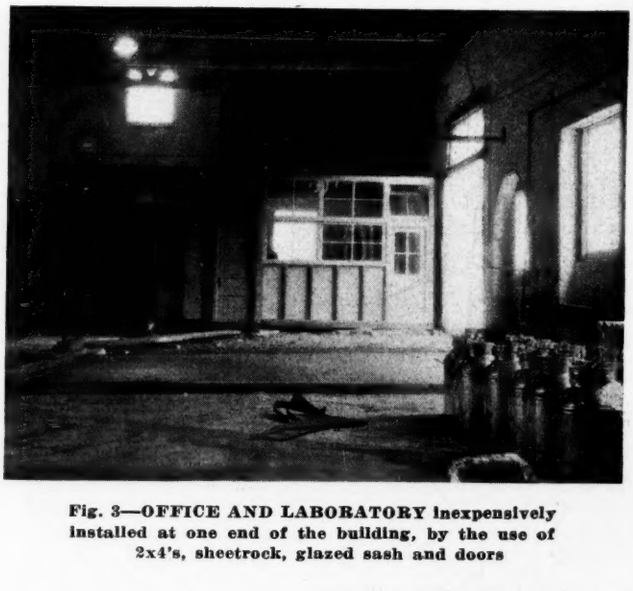


Fig. 3—OFFICE AND LABORATORY inexpensively installed at one end of the building, by the use of 2x4's, sheetrock, glazed sash and doors

By close co-operation between owner and tenant it has been possible to reduce the overhead of both parties and to obtain a more efficient operation of all forces. In this case there was no chance of obtaining the additional savings obtainable when the two plants are complementary in products. Each plant has an entirely distinct product but the savings anticipated in heat, power, and maintenance will alone make the move a profitable one.

CALIFORNIA CANNERIES DEVELOP

Efficient Systems of Materials Handling

THE SECOND OF TWO ARTICLES

By EARL D. STEWART
Assistant Editor

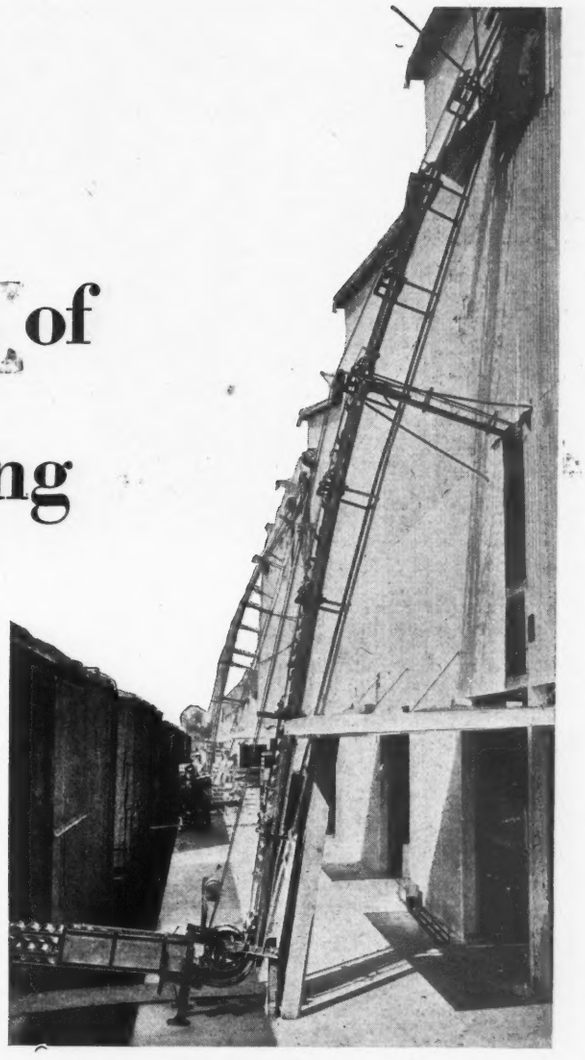


FIG. 11—CAN ELEVATORS at the California Co-operative Producers' Sacramento plant conveying empty cans from cars to upper floors of the factory.

SEVERAL METHODS for mechanical handling of the raw materials in California fruit canneries were described in the previous installment of this article, which appeared in the January issue of FOOD INDUSTRIES. The systems were traced up to the point where the fruit was distributed to the operators who place it in the cans. At this point it is desirable to digress for a moment to discuss the methods of unloading cars of tin cans, as well as the best ways of handling them in the factory, for the container is almost as important as the raw material in the production of canned foods. Cans are generally received in bulk in box cars, except for the smaller sizes, which are either crated or simply wrapped in heavy manila paper. The crudest way of handling cans is to load them on trays and truck them either to the canning tables or to the storage bins.

Most factories spot the car at a can elevator on a platform alongside the track. A chute is attached to the boot of the elevator into which the cans roll from the car. The elevator consists of a rubber-covered belt under which the cans roll in guides (see Fig. 11). If the elevation is very great, or almost vertical, spring blades press against the belt to hold it firmly against the cans. From the elevator the cans roll on tracks or are carried by cable conveyor to storage bins, or to the canning tables, or to tables where they are placed on trays and trucked to the canning tables.

One factory with no second floor has its bins between the cars and the canning room. The empty cans are either stored here or carried by conveyor under the floor directly to the canning tables. Another plant, which has grown by spreading over a new area each time the factory was enlarged, now has its canning tables several hundred feet from the spur track where the cars of cans were spotted. Consequently it hauls cans a long distance by a conveyor above the ceiling of the buildings.

Horizontal can conveyors usually consist of strap-iron guides open at the top and not quite as high as the can. A small steel cable (about $\frac{3}{8}$ in.) runs on pulleys placed every 3 ft. on the bottom of the guide rails. The cans rest on the cable and are carried along by it. When the rails are full or jammed for any reason the cable slides along under the cans. One factory uses narrow rubber and canvas belts for moving cans, claiming that there is less jamming and that the whole system is less noisy than cable conveyors. Where cans must be elevated, belts are customarily used, on account of their additional friction on the cans. Where they are to be lowered, a chute does the trick. By completely inclosing them in strap-iron guides and gradually twisting them the cans can be laid down on their sides or stood upright as may be required. With combinations of twists, chutes, belts, and cables, empty cans can be transported around a plant with great ease. Twists are used also to decrease their speed when cans must drop a long distance.

One factory uses a horizontal cable conveyor under the loading platform to carry cans to the elevators. By this means the cars may be spotted at any convenient place instead of at some particular point. A row of boards in the platform can be removed to provide easy

FIG. 12—DELIVERING CANS to canning tables at California Co-operative Producers' plants in Sacramento and Oakland. Note how the cans line up four abreast on the rack above the fillers.

access to any place on the conveyor. Usually the cans may be used from either car or bin. If from the bin, a system of collapsible chutes that can be adjusted to the height of cans in the bin is used to speed up placing the cans on the conveyor.

One of the larger companies, which uses much hand labor, moves the cans from bins or car to tables in one corner of the canning department by conveyors. Here they are placed on trays and trucked to the canning tables. The simplest improvement on this method consists of a main conveyor running transverse to the tables with laterals running down a rack above each one. The lateral conveyor is placed at the edge of the rack with the inner edge open—i.e., with no guide rail. A gate can be momentarily placed across the main conveyor and the cans from it thus diverted down the lateral. When the first can reaches the end it stops and those following are moved off to one side by the movement of the belt carrying them. This is possible because of their circular cross-section which permits them to slide around each other until stopped by some obstacle. By this means the cans line themselves up four deep on the rack in front of the canners, as shown in Fig. 12. An operator moves along the main conveyor and keeps the racks filled as fast as the canners empty them. By appropriate guides and chutes four sizes of cans may be handled in this way.

Another factory conveys the cans under the floor of the canning room. Risers at each table bring the cans to the canning tables and line them up in a single line above the table within easy reach of the workers. The speed of canning keeps a fairly steady movement of the cans along the line.

THE NEXT STEP depends on the system used to move the filled cans to the siruping machines. If they are carried by trucks, the canner takes the cans from the rack above, fills, weighs, and places them on a tray. When the tray is filled the checker removes it and credits the canner's rate card. If the filled cans are taken away on a belt conveyor, the checker fills a tray with empty cans and credits the canner with them. Evidently some system of eliminating the checker and the awkward trays would be advantageous. This has been done in two

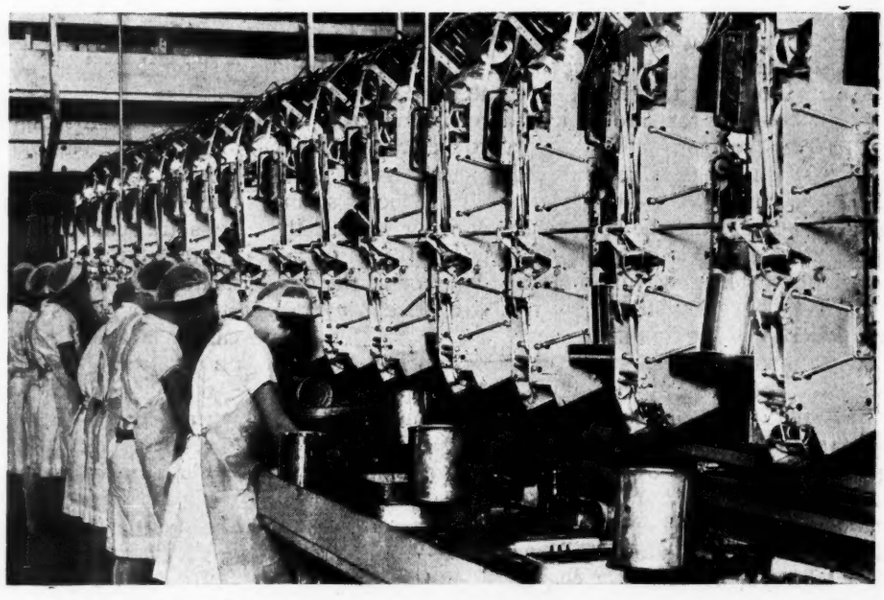


FIG. 15 — ALBERTOLI SYSTEM of can-handling at Libby, McNeill & Libby, Sacramento.

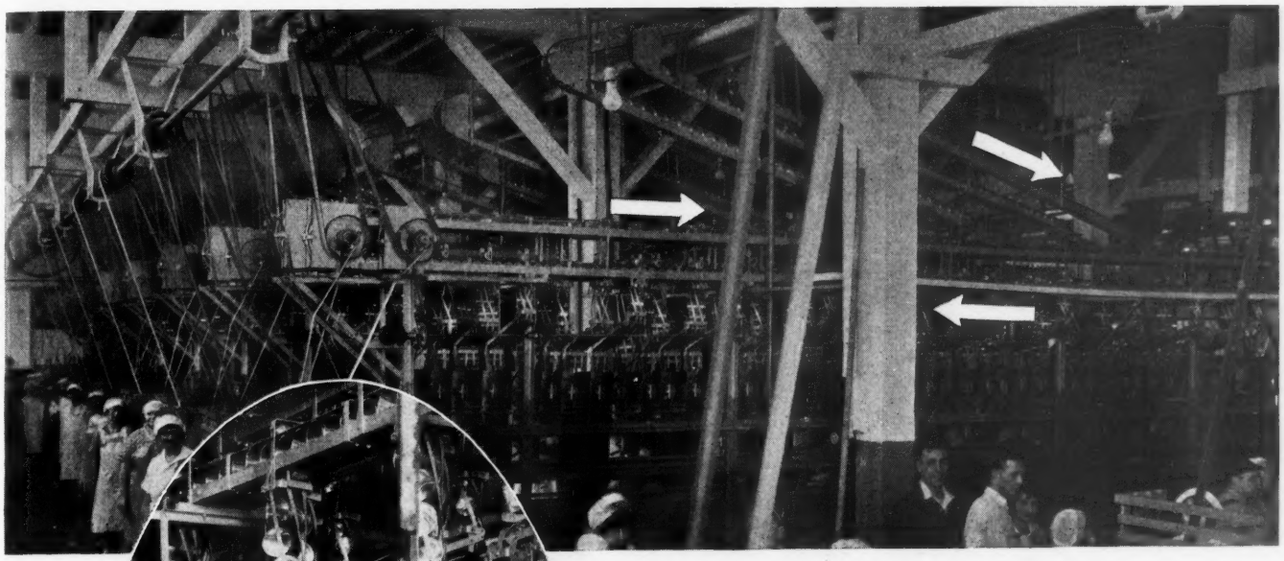


FIG. 13—ABOVE: REAR VIEW of canning tables at California Canneries Company, showing the feed chutes from the can-storage room and horizontal conveyor which keeps the canners' chutes filled. Arrows indicate direction of can travel.

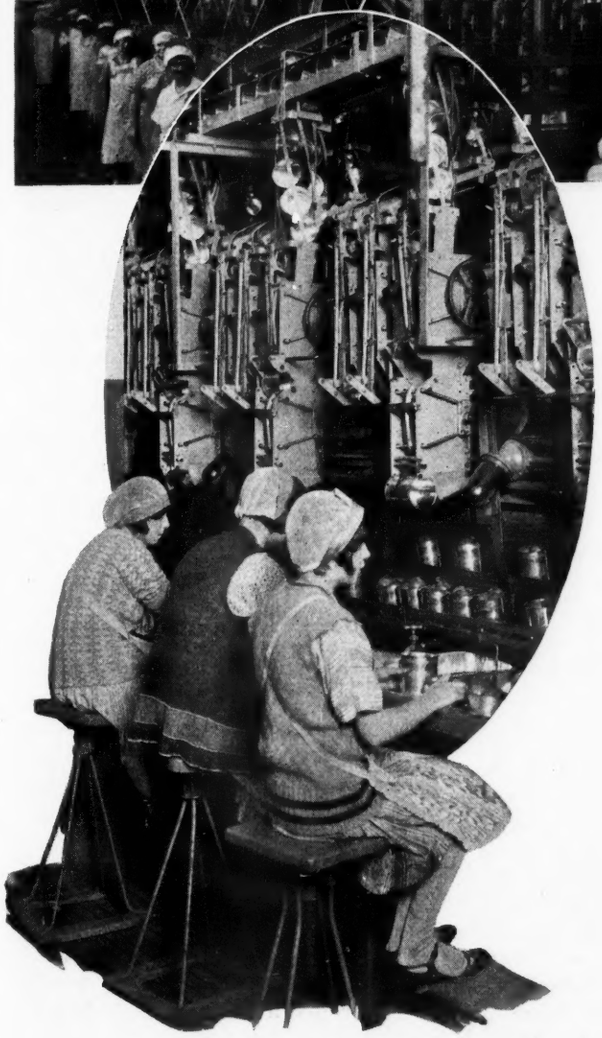


FIG. 14—LEFT: FRONT VIEW of canning tables shown in Fig. 14. Cans are counted and stamped with a code mark automatically. Note the two belts for taking away filled cans of different grades.

ways that are identical in principle but differ somewhat in the details.

The one in use at the plant of the California Canneries, Inc., San Francisco, is typical. Here the empty cans are used from storage bins on the floor above. Four sizes of cans are used and each is placed on a horizontal conveyor that passes over the canning department on the storage floor. Although its direction is horizontal, the cans in this conveyor are inclined at an angle of about 45 deg. so that at the chutes leading to the canning tables the cans will drop out without attention or opening a gate.

Above the canning tables, located on the floor below, are placed four belts with guides completely encircling them. Into these guides and onto the top run of the belt the cans fall from the chutes. They are carried around end pulleys by the belt to the lower side of the lower run of the belt, in the manner shown in Fig. 13. The cans now roll along the guide rails by belt pressure from above. At each canner's position are four chutes, one for each size can. If these chutes are empty, the cans rolling along the horizontal guide rails drop into them until they are filled and then roll to the next one and fill it, and so on. The length of these chutes and the ones from the storage bins are adjusted so that when full the last can is flush with the guide rail and does not stop the onward movement of the remaining cans.

On each chute leading to the canner's working position, as shown in Fig. 14, is attached a counting machine and an indelible-ink stamping device. As she pulls the can from the chute, the counting machine is tripped. The next can rolls down one place and is automatically stamped with a code mark and the worker's number. This leaves a space at the top of the chute for another can, and the next one on the horizontal conveyor drops into it. When all chutes are filled, the cans simply roll around on the horizontal conveyor. Though appearing to the eye somewhat complicated, this system is really quite simple and requires very little attention. Occasional jams occur, but one man on the floor can take care of them. One man in the storage bins keeps the cans moving into the chutes to the tables below.

In this factory the fruit is brought to the canners on one conveyor and the filled cans are taken away by another. As the cans are counted automatically and there is always a supply at hand, great speed is attained by the canners and filled cans sometimes reach the siruping machines faster than they can handle them. It was stated that this system has eliminated at least twenty truckers and checkers from this plant.

Libby, McNeill & Libby's Sacramento plant uses the Albertoli system, shown in Fig. 15. It is similar to the

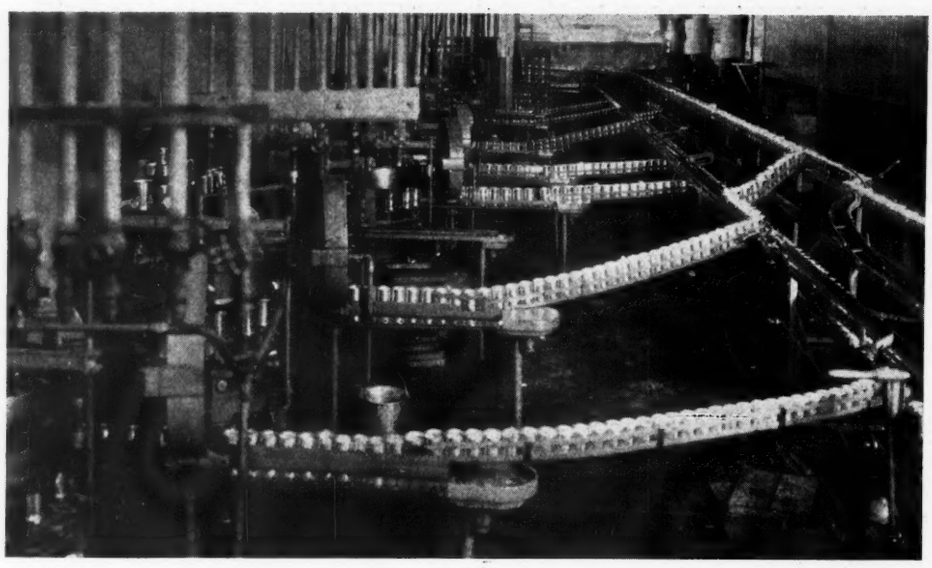


FIG. 16—AUTOMATIC can conveyors transferring filled cans to sirupers at the California Canneries Company. The forest of pipes at the left provides the several grades of sirups to each siruper.

one just described but simpler. In it the cans, inclined at a 45-deg. angle, are carried along a horizontal conveyor with openings leading to each position in one side of the guide rails. If all chutes are full, the cable simply moves under the cans. When a can is removed from a chute those behind will drop down, leaving an open space at the top. The drag of the cable on the line of cans pushes into it the can closest to the chute, and all of the cans on the horizontal conveyor move along to fill up the gap. Since with this method the cans are likely to jam and refuse to fall into the chute if they happen to be centered exactly behind each other, a reversing gear is attached to the drive pulley of the horizontal conveyor. By this means the movement or drag on the line of cans is reversed about every half minute and jamming is effectually prevented. The stamping and counting devices are the same as in the other system.

If the filled cans are taken to the siruping machines by truck there is, of course, no particular problem involved in getting the cans to the proper machine, but if they are taken by conveyor some sort of distributing device is necessary. By confining the canning of one grade or

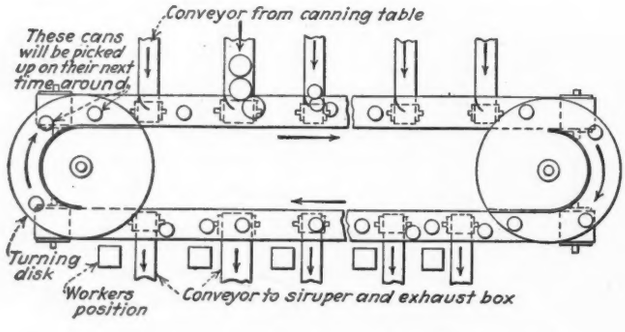

Conveyor from canning table
These cans will be picked up on their next time around.
Turning disk
Workers position
Conveyor to siruper and exhaust box

FIG. 18—SORTING OUT the different sizes and grades of cans filled with fruit, and sending them to the proper line for siruping and closing, is easily accomplished by this system.

size to a single table, or group of tables, the conveyor system may be led to the proper machine, in the manner shown in Fig. 16. With a single table this method is quite satisfactory and even with two or more tables delivering cans to the same conveyor it can be made to work fairly well. Here, of course, there is much chance for jamming and upsetting of cans, particularly where the main conveyor passes a lateral that is delivering cans onto the main line. One factory uses this system with considerable success although it is attended by consider-

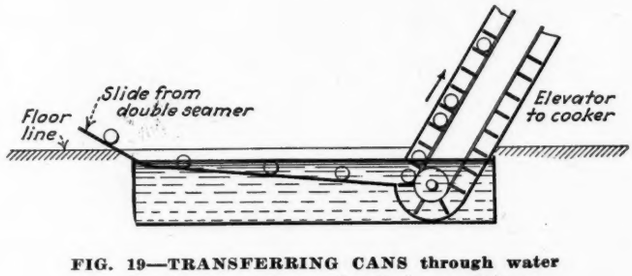


FIG. 19—TRANSFERRING CANS through water under the aisle between the closing machines and cookers.

able muss from upset cans. Also in case of a spurt by workers at the canning tables the whole line may be filled with cans before the siruper and exhaust box can take care of them.

AN EXCELLENT, simple method of getting the cans to the siruper is found in one plant where all the conveyors from the canning tables discharge onto a wide, slow-moving belt, as shown in Fig. 18. The cans are carried down this belt and around a revolving disk onto a second parallel belt moving in the opposite direction. This belt passes in front of the siruping machines. At each machine an operator takes off the grade, size, and kind of fruit for his particular line of processing machinery and starts it through the siruping machine. If he misses a can it goes on past and is carried on to the first belt by a second disk at the end and he gets it the next time it comes around. This plant was canning peaches and pears on the day it was visited. Both sorts of fruits in cans of all sizes, both in halves and slices, were traveling on this system without confusion.

After passing through the siruper exhaust box and sealer, the cans are carried by drag chain conveyor to the continuous cooker and cooler. Usually there is an aisle between the sealing machine and cooker, the cans either dropping under the floor and moving through a tank of water, as shown in Fig. 19, or dropping into an elevator

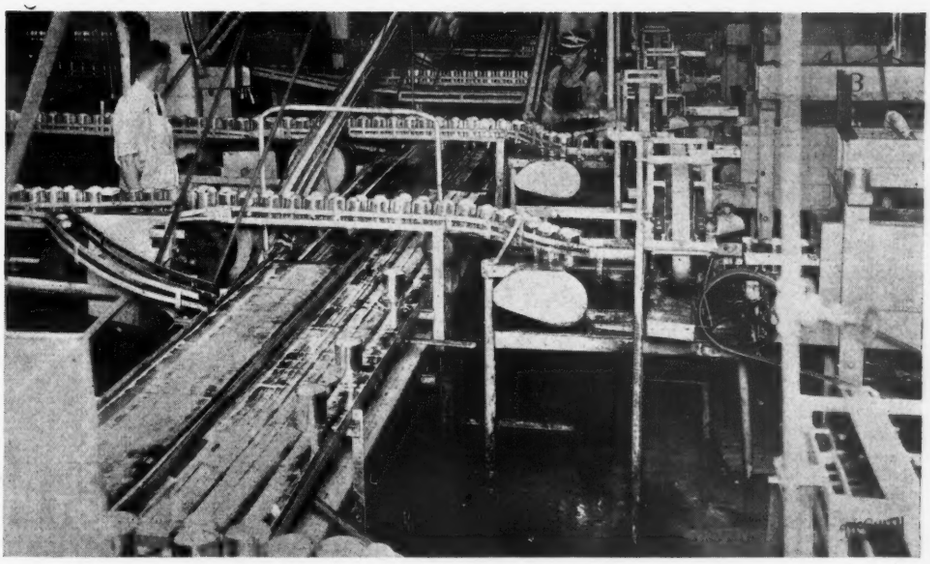


FIG. 17 — DELIVERING filled cans from canning tables to drainers and sirupers at Libby's, Sacramento. Cans on the belt will be removed by a worker further along the line. Note the inclined belt conveyor from second floor and also chute for removing cans from cable to belt conveyor.

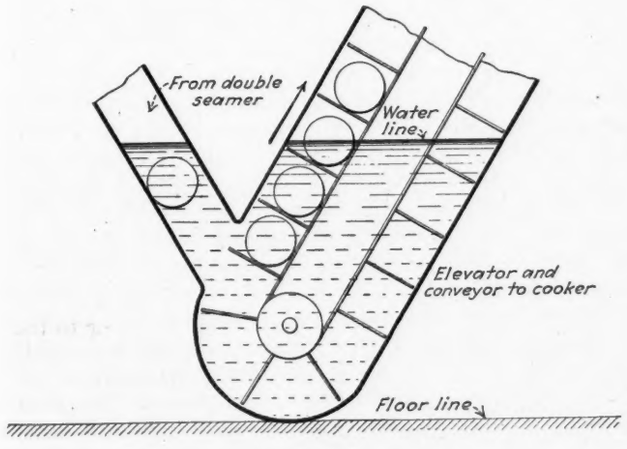
boot, as in Fig. 20, which is filled with water if they are to be moved overhead to the cooker. This part of the equipment usually is standard in all plants.

Transporting the cans from the cooler to the warehouse is almost universally done by truck, probably because of the practice of cooling in temporary storage overnight before final stacking. By this method and also by testing the cans by tapping each before final consignment to the warehouse, defective cans may be kept out of the stacks. One cannery, however, rolls the cans directly from the cooler into the temporary storage which, in this instance, is located on the second floor.

In the warehouse the cans are handled both by hand and by truck. It seems somewhat strange that none of the canneries visited by this writer uses a portable elevator to carry cans to the top of the stacks, particularly when they are higher than a man can conveniently reach. Labeling usually is a machine operation except in the case of the gallon cans, which usually are labeled by hand. Packing into shipping boxes or cartons usually is done by hand, though one large factory with high-speed labeling machines uses a mechanical caser.

Large factories make their own boxes from box shooks. Cartons, of course, are received flat and are sealed by sealing machines. In all the plants visited warehouse handling is by hand truck though one very large plant uses small electric trucks for the longer hauls.

FIG. 20—USING WATER to break the shock of the fall into the can-elevator boot.



No plant that was studied was completely equipped with modern conveyor systems of handling. There are many reasons for this. To begin with, fruit is always received in field boxes, and for obvious reasons it would be difficult to change this method if fruit is to be received in good condition and free from bruises. While field boxes could be unloaded from cars or trucks by gravity rolls or belt conveyor, such as is used in orange packing houses, a method such as this would require just as many laborers as would be necessary when doing it with trucks and would save no time.

Again, no machine for peeling pears has yet been developed and the peach-pitting machines in use so far are still more or less experimental. Consequently, reliance must still be placed on human skill for these operations and for sorting the fruit for quality. Filling the cans also is a hand operation and is likely to remain so if quality is to be preserved. It is worthy of note, however, that one factory uses a machine quite satisfactorily for filling sliced peaches into cans. It is to the speed of these hand operations, then, that the speed of handling must be synchronized and the additional speed of machine conveying is often not needed.

More important than these, however, is an economic factor. California canneries, as a rule, pack a greater variety of products than do canneries in other states. Maryland, for example, has something over 200 canneries packing corn and tomatoes only, and only about 70 of them pack more than two products. California has 85 plants which confine themselves to only one or two products and over 100 which pack more than two, including 68 which pack five or more as against 37 for Maryland. Naturally a factory installing permanent equipment for a particular fruit, such as peaches, will have this equipment idle for the greater part of the year. In addition to the expense of installation and depreciation will be ground rent on the space occupied by the equipment. If simple, though perhaps mechanically less efficient equipment, is used, it can either be adapted to the preparation of a variety of products or inexpensively moved out and replaced with equipment properly adapted to succeeding products. This fact may and probably often does offset the additional advantages of mechanical handling equipment.

By J. C. MARQUARDT
New York Agricultural Experiment Station, Geneva, N. Y.

How the slicing and spreading requirements of a Neufchatel-type cheese were met

•

MAKING CREAM CHEESE *To a Formula*

THE exact origin of American type cream cheese made by a modified Neufchatel process is unknown. Cheddar or American cheese, which is a hard-ripened cheese made from milk, should not be called cream cheese. Some of the earlier writers have described the method of making American type cream cheese after a modified Neufchatel process. It resembles a double cream cheese made in England, and also a cheese which is used in France.

Although we are not concerned with the origin of American cream cheese, it is of interest to note that the method of making this cheese has been modified from time to time in order to meet the requirements of the trade. Cream cheese of the Neufchatel type was improved by making it from pasteurized milk. Although it was claimed by some that pasteurization decreased the smooth texture of the cheese, it was understood that the increased keeping qualities offset this slight change in texture. Homogenization of the milk was introduced into the process in order to prevent excessive losses of fat in the whey. Methods of cooling the curd during drainage periods were introduced in order to increase further the quality of the cheese.

Consumption of cream cheese in the United States has increased rapidly during the past decade. Its consumption has spread from the large Eastern cities to all parts of the country. In many cases its manufacture has engaged the entire attention of certain companies during recent years. The production of cream cheese of the Neufchatel type in the United States has exceeded 20,000,000 pounds annually. Of this amount approximately 10,000,000 pounds is produced annually in the State of New York.

With the increased consumption of this cheese certain higher trade standards were imperative. Our change in living requirements each decade also called for certain changes in the production of this cheese. Prominent among the new requirements augmented by the trade was the demand for a cheese that would slice and spread. A method of making a cheese that could be sliced or spread was presented to the manufacturers a few years ago. Attempts were made by the trade and in research laboratories to accomplish these things by modified methods. Although several serious attempts were made, certain natural conditions of milk limited the possibilities of these methods.

The old method of preparing cream cheese of the Neufchatel type presented certain problems which could not be solved satisfactorily to meet the requirements for a cheese that would slice and spread. Although it was possible to produce a cheese of this type at intervals, it was not possible to do so every time a batch of the cheese was made.

During the summer of 1925, A. C. Dahlberg (Dahlberg, A. C.: A New Method of Manufacturing Cream Cheese of the Neufchatel Type; *Journal of Dairy Science,* Vol. X, No. 2; March, 1927) conceived the idea of making this cheese by an entirely different method. His first step was to analyze cream cheese samples to correlate their quality with composition. At the conclusion of this work it was decided by the investigator that the cheese should contain 38 to 43 per cent water, 43 to 48 per cent fat, and 0.5 to 1.25 per cent of salt.

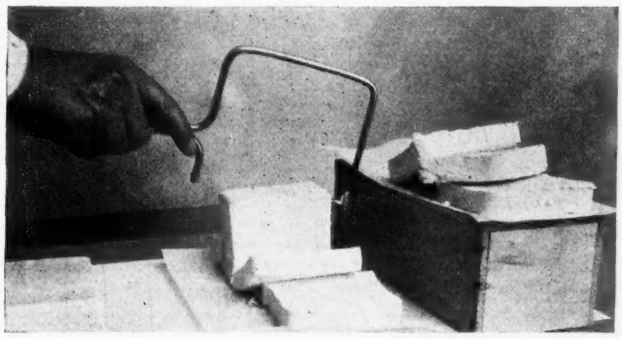
The results of studies of homogenization and the clumping of fat in milk and cream at the New York Agricultural Experiment Station made it reasonable to suppose that through homogenization of cream its viscosity or plasticity might be increased to such an extent that a body and texture suitable for cream cheese would be produced. Consequently, cream was standardized in order to compare its composition with cream cheese. The cream was pasteurized and homogenized. The result of the first trial was sufficiently encouraging to warrant a rather detailed study of the method, especially considering the evident advantages of the method if it should prove successful. Also the method is of scientific interest and might serve as a basis for other investigations of similar character. Consideration was given to the effect of varying the percentages of fat and total solids, of

varying temperatures and pressures of homogenization, and the like.

The new method can be presented most advantageously by first giving in detail the final method as adopted, and later giving the effect of variations from the standard method.

The Method Finally Adopted—Sweet cream of good flavor containing 40 to 45 per cent of fat was the basis for the cheese. To this cream 5 per cent of soluble, dry skim milk of good flavor was added. One-half per cent of shredded agar, free from objectionable flavor and odor, was stirred into a small portion of the cold cream, and then added to the large bulk of cold cream.

The mixture was then pasteurized at 180° to 185° F. for 10 minutes. After pasteurization the mixture was cooled to 110° F. Common salt to the extent of 0.75 per cent, and 0.5 to 1 per cent of good commercial starter were then added. The mixture was passed through a coarse strainer into the homogenizer. The homogenization pressure of 3,500 to 4,000 pounds per square inch gave best results. The cream as it left the homogenizer had the consistency of soft butter, or was slightly stiffer than ice cream as it comes from the freezer. The warm



THIS REPRODUCTION shows the slicing properties of cream cheese of the Neufchatel type made by a new method developed at the New York Agricultural Experiment Station.

cream mixture was usually raised from 5 to 10° in temperature during the homogenization process.

The cream mixture was immediately placed in the final container and allowed to stand in a refrigerator at 32° to 40° F. for 1 or 2 hours until the temperature of the cheese was reduced to 70° F. The cheese was held at 70° F. for 10 to 15 hours or until it had developed sufficient acid to have a mildly acid flavor. The product was then considered to be cream cheese. It was stored at 32° to 40° F. and was ready for immediate consumption. At this temperature cheese was held for 2 to 5 weeks without undergoing any serious deterioration in flavor.

Cream cheese made by this process was always smooth and buttery in texture without any traces of crumbliness. Its body was firm. The cheese possessed excellent spreading qualities and could be sliced either as well as or better than cream cheese made by the old process. It looked and tasted richer than the ordinary cream cheese, even though it did not contain a higher percentage of fat.

Effects of Variations of Method—Experimental cream cheeses were prepared containing 30, 35, 40, 45 and 50 per cent of milk fat. Increased percentages of fat caused increased firmness of body and decreased the quantity of whey that would drain from the cheese under adverse conditions. Cheese containing 30 per cent fat was quite unsatisfactory, due to its soft sticky condition and leakage of whey when warmed to 70° F. or above. Under ideal conditions 35 per cent of fat was satisfactory, but this quantity of fat would not be sufficient for commercial conditions. The most satisfactory cheese was made with 40 to 42 per cent of fat and unquestionably the flavor was finest with this richness. When this cheese was stored above 70° F., some whey drained from it. Although this small amount of whey is objectionable, it must not be forgotten that cream cheese is perishable and should always be kept in a cold place. If the cheese is stored above 70° F., it will spoil quickly irrespective of whey drainage. The body of the cheese with 40 per cent of fat was sufficiently firm and free from stickiness to permit the proper slicing of cheese loaves. The flavor was rich, creamy, and mildly acid. The texture was very smooth, buttery, free from crumbliness, and the cheese could be spread easily.

When the percentage of fat was increased to 45 per cent, two slight alterations in the cheese were made. The flavor was somewhat richer and a few people who ate the cheese alone without other foods said that it was a little too rich. Cheese with this percentage of fat did not leak whey at any temperature up to 85° F. When 50 per cent of fat was used the cheese was noticeably too rich in flavor for many people who ate it.

A LIMITED NUMBER of fat globule measurements were made to show the effect of homogenizing the cream mixture upon the size and distribution of the fat globules. One cubic centimeter of cream was diluted with 99 cubic centimeters of distilled water and examined in hanging drop preparations. The fat globules in the cream after pasteurization and prior to homogenization were 4.2 microns in diameter, and in 100 fields examined all existed as individuals. After homogenization the size of individual fat globules was determined from those existing singly, because of the difficulty of measuring globules present in clusters. The size of the clusters or aggregates of fat globules, and the ratio of individuals to cluster were determined. A total of 128 fat globules had an average diameter of 2.04 microns. In the same microscope fields there existed 219 clusters with an average size of 11.9x8.2 microns. It was evident that most of the fat globules in the homogenized cream existed in large clusters of globules of about one-half their original size.

The aggregation of the fat globules formed a network in which the milk serum was held. The body and texture of the cheese probably was due to this changed condition of the fat—a change which might be considered, using the language of colloidal chemistry, as a change of the fat from the dispersed to the continuous phase.

An attempt was made early in this work to make a firmer cheese that would not leak whey by increasing the percentage of non-fat milk solids through the use of dry skim milk. Increasing the percentage of non-fat milk solids reduced the rich fat flavor to a considerable degree and improved the body by making it slightly firmer and less sticky. It did not have any marked effect upon whey drainage, which was so greatly altered by the percentage of fat.

The percentage of non-fat milk solids was held low for two reasons. If 10 per cent or more of dry skim milk was used, the finished cheese could develop too high a percentage of acid at storage temperatures that were too warm. Furthermore, when exposed to drying condi-

tions the milk sugar crystallized out and formed a grainy coating on the cheese. The addition of 5 per cent of skim milk solids is desirable not only to decrease the buttery taste of the cheese but to increase slightly the firmness of the cheese and to impart to it better slicing properties. Probably it would have been desirable to omit the additional milk sugar, but no feasible method was apparent by which the skim milk solids could be obtained without the sugar.

Greater homogenization pressures were essential in the production of cream cheese by the new method than are commonly employed in the manufacture of other dairy products. As a general proposition it was found that pressures varying from 3,500 to 4,000 pounds per square inch produced a firmer bodied cheese with less stickiness and less drainage of whey than did lower pressures. When the fat content was high, such as 45 to 50 per cent, a pressure 500 pounds less was sufficient and 4,000 pounds pressure produced a cheese somewhat too rich in taste that resembled, to some extent, the taste of cream almost ready to form butter in the churn.

Any temperature of the cream above 105° F. was suitable for homogenization so far as the body and texture of the resulting cheese were concerned, but it is obvious that starters could not be safely added to cream homogenized at a temperature much in excess of 110° F., because the temperature was increased 5 to 10° F. by homogenization. In several tests the cream was homogenized at 145° F., cooled to 70° F., and the starter added. The salt was sometimes added with the starter and also after the cheese had ripened to the proper degree. No special advantage could be determined in this method of adding salt and starter after homogenization, and it had the disadvantages of making extra work, and of the excessive mixing of the cheese tending to make it sticky.

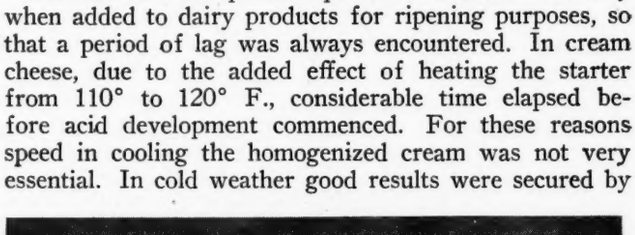
Cream cheese was also prepared from cream which had been pasteurized, cooled, and ripened with commercial starter at 70° F. The cream was then pasteurized again, salt was added, and the whole mixture with the proper percentage of acid was homogenized. By this method it was hoped that the acid development would be checked, even when the finished cheese was stored at too warm a temperature. The method proved unsatisfactory because the homogenization of sour cream produced a cheese with a soft, sticky body from which whey drained freely.

Commercial rennet was tried by adding it when the starter was added in the recommended process. The rennet gave the homogenized product a more buttery appearance and taste, and whey drained much more freely from the cheese. When added after homogenization the rennet caused increased drainage of whey. For these reasons the use of rennet in the manufacture of this cheese was not desirable.

CREAM homogenized at colder temperatures gave poor results. The fat was not properly homogenized, the cream appeared to be partially churned, the body of the cheese was softer than usual, and whey drained from the cheese quite freely. Measurements of 100 fat globules in cream homogenized at 90° F. showed them to be 3.5 microns in diameter, or only slightly smaller than those in normal cream. Only 46 clumps measuring 11.6 x 9.7 microns were found per 100 individual fat globules, showing a great reduction in the aggregation of the fat globules.

The quantity of starter required to develop the proper acidity was dependent upon many conditions, but 0.5 to 1.0 per cent usually proved successful. The percentage of salt added to the cheese had an effect not only upon the rate of acid development but also upon the kind of flavor produced. When the percentage of salt was held below 1.0, the salt did not seriously interfere with the growth of the starter organisms.

Most starters are past the period of maximum activity when added to dairy products for ripening purposes, so that a period of lag was always encountered. In cream cheese, due to the added effect of heating the starter from 110° to 120° F., considerable time elapsed before acid development commenced. For these reasons speed in cooling the homogenized cream was not very essential. In cold weather good results were secured by placing the warm cheese as it came from the homogenizer in the room for ripening at 70° F. without previous cooling. In the summer this procedure could not be followed, because the cheese became sour without developing desirable flavors. Therefore it was deemed advisable to cool the cheese always to 70° F. by placing it in a refrigerator before ripening.



THE SLICE OF CHEESE on the left shows the smooth compact texture of cream cheese made by the new process, the other being a typical soft cheese frequently represented as cream cheese of the Neufchatel type.

Agar and gelatin were tried in the cream cheese for the purpose of holding the whey so that none would drain out even though the cheeses were stored at temperatures that were too warm. The quantity of agar was varied from 0.2 to 1 per cent and the quantity of gelatin from 0.5 to 2 per cent. Both the agar and gelatin were dissolved in hot water and stirred into the cream. Also they were dissolved by mixing the dry powders directly into the cream.

The use of water to dissolve the agar or gelatin was a distinct disadvantage, because it increased the percentage of water in the cheese. Hence, after several trials, this method was discontinued, and the dry gelatin or agar was added directly to the cream and dissolved by pasteurization. The gelatin presented no problem in this respect, because it dissolved readily at the ordinary pasteurization temperature of 145° F. Tests were made, however, to determine the temperature and time required to dissolve powdered agar in water. It was learned that powdered agar began to dissolve at approximately 170° F., and a temperature of 180° F. for ten minutes seemed to dissolve the agar as well as did the boiling temperature. For this reason the powdered agar was dissolved in the cream by pasteurization at 180° F. to 185° F. for ten minutes.

Several tests with varying percentages of gelatin and agar showed that 1 per cent of gelatin or 0.5 per cent of agar gave best results. Since the cream cheese contained 50 per cent, or less, of water the actual concentration of gelatin in water was 2 per cent and of agar 1 per cent. Both of these percentages were able to form a jelly at room temperature. The presence of these gelatinizing substances produced a cheese with improved slicing qualities and a slightly firmer body. They also reduced the tendency of cream cheese to exude whey at warm temperatures, but neither weak agar nor gelatin jellies in the cream cheese could hold the whey and prevent some of it from draining out of the cheese, if the cheeses were improperly made in other respects. The presence of agar in the cheese was distinctly advantageous.

POWDERED AGAR used for cream cheese making was of excellent quality and practically free from flavor and odor. Powdered pure food gelatin of high quality, such as that used in ice cream manufacture, proved excellent for this purpose. The use of agar had the disadvantage of requiring a high temperature to dissolve it, but its use had the advantage of making a firmer bodied cheese of improved slicing qualities. The use of agar is especially recommended. More recent trials have indicated that powdered or shredded agar has a decided advantage over gelatin in improving the texture of the cheese.

The new method of manufacturing cream cheese had several distinct advantages over the old Neufchatel process. When the milk for cheese making was received it was immediately reduced to the same approximate bulk as the finished cheese by separating into rich cream. This reduced the volume of cream which needed to be handled. No bags for drainage were needed. The acid development could be checked at any time by cooling the cheese, because the moisture content was standardized before the cheese was made. This permitted better control of the extent of acid development and prevented spoilage of cheese by too much acid in a slow-draining curd.

The cream cheese could be made more uniform in body and texture by the new process. The body and texture were determined largely by the composition of the cheese, the sweetness of the cream, and homogenization temperatures and pressures. These factors were readily controlled and uniform cheese was made. The labor needed to make cream cheese by the new process was considerably reduced.

Cream cheese of more desirable characteristics was made by the new process. It was smoother and more buttery, tasted richer, spread better, and sliced as well or better than cheese made by the Neufchatel method. Its flavor from the standpoint of acid development and bacterial growth could be controlled to better advantage and the cheese was finished and in the refrigerator twelve to twenty-four hours sooner when made by the new method. The cheese could be packed more solidly in loaves or packages, and probably because of the exclusion of air, it did not mold as readily under improper storage conditions. The cheese was never crumbly.

It seldom occurs that a new method is proposed that in all respects is advantageous to use. Cheese made by the new method had too high a milk sugar content, which permitted the excessive development of acid under warm storage conditions. This disadvantage was offset to some extent by a reduced mold growth. Cheese made by the new method was considered to taste too rich and buttery to suit a few people, but it should be stated that it was consumed in rather large quantities before this characteristic was discovered. It was essential that rich tasting cheese be made by this process, because a low percentage of fat was conducive to leakage of whey. Cheese of a given percentage of fat tasted richer when made by the new process.

The cheese made by the new process was more pasty than regular cream cheese. However, it sliced just as well as any Neufchatel cream cheese made experimentally or purchased at the market. All cream cheese is too sticky to cut with a knife and should be sliced with a wire or string after the tin foil surrounding the cheese has been cut with a knife.

During the past few months the merits of the new method have become apparent to the manufacturers of cream cheese. Although the new method is very simple, all details of procedure must be followed very accurately. This is essential in order to have the proper water, fat and solids balance. Close attention to the detailed procedure also is essential to obtain the correct action of the agar. Also the use of a culture of excellent quality, salting before homogenization, and homogenizing at the proper pressure and temperature are of paramount importance in obtaining an excellent finished product. It is possible to fill the cheese into 5-pound boxes direct from the homogenizer.

Cream cheese made according to the new process, in addition to meeting the requirements already met by the old process cheese and having additional favorable qualities, offers a new field for the use of cream cheese. The new type cheese can be made into salad dressings by thinning with milk and beating. The old-method cheese can be used likewise but it does not dissolve as readily nor as completely as does the new-method cheese, on account of its rennet content and heat treatment.

The new-method cream cheese also mixes very readily with relish, and presents excellent possibilities for development as a base for cheese relish spreads.

Storage Stocks Larger Than a Year Ago

COLD-STORAGE holdings of butter, cheese, frozen poultry, and frozen beef on Jan. 1 were larger than on the same date last year, whereas stocks of apples, frozen pork, and eggs were smaller, according to the January Cold-Storage Report of the Bureau of Agricultural Economics, U. S. Department of Agriculture.

Butter stocks were 81,837,000 pounds, as compared with 43,783,000 pounds last year and an average of 48,580,000 pounds for the last five years. Stocks of American cheese were larger than a year ago, but most foreign type cheeses were in smaller supply.

Total stocks of meat on Jan. 1 were 826,306,000 pounds, as compared with 857,490,000 pounds last January. A small increase in frozen and cured beef was offset by decreases in frozen lamb and mutton, and frozen and dry salt pork.

Turkeys were in smaller supply than last year but other kinds of frozen poultry were considerably higher, the totals amounting to 139,998,000 pounds on Jan. 1, compared with 123,432,000 pounds last year.

Case eggs totaled 710,000 cases, or about half as many as last year. Frozen eggs, 53,644,000 pounds, though less than last year were much above the five-year average.

Abstracts of Current Literature

BEET DRYING. O. W. Willcox. *Sugar 31,* 425-9; December, 1929.

The idea of drying beets for storage before extracting the sugar is old, and has passed through various cycles of flavor and disfavor. The De Vecchis and Oxford systems have now been in practical operation long enough to furnish data for judging the merits of the idea. The Sanguinetto factory in Italy, after some years of operation, is reported by experts to show no sucrose loss in the drying operation. The Eynsham factory in England observes a loss of slightly more than a pound of sugar per ton of beets. The Russian Sugar Trust's experimental factory at Derjugin reports the highest loss of these 3 factories; namely, 3.4 pounds loss per short ton. Even on this basis, the loss is only 22.4 cents per ton (rating sugar at 6 cents per pound), whereas experience indicates that the unavoidable deterioration loss in storing undried beets until they can be used is of the order of $1.60 per ton. The De Vecchis system of drying beets is illustrated by an elevation drawing, and several illustrations are given of the Oxford system as practiced at the Eynsham factory. There are several economies in operating and overhead costs, in addition to the saving effected by preventing deterioration of stored beets; for instance, the campaign season can be greatly lengthened, and the growing territory can be enlarged without the necessity of building new factories.

* * *

LICORICE. John Uri Lloyd. *American Journal of Pharmacy 101,* 805-15; December, 1929.

Licorice grows as a weed in Asia Minor and parts of Europe. As a leguminous plant, it may be largely responsible for the fact that the very high fertility of the soil in this region has been maintained, without fertilization, through many centuries of cultivation. Native diggers collect the root, their cheap labor keeping the cost very low. At factories in Smyrna and other licorice centers, the root is coarsely ground and extracted with hot water. For the American market the root itself is shipped, because the import duty on the extract makes such extraction unprofitable. The decoctions made by boiling the root with water are boiled down to the consistency of tar, and then carefully evaporated to a paste, which is poured hot into paper-lined boxes (capacity about 300 pounds). The paste contains 25-26 per cent of moisture. The more modern factories, by using vacuum evaporators, are able to lower the moisture content to about 20 per cent without loss of quality.

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FOOD ANALYSES. H. C. S. Snethlage. *Chemisch Weekblad 26,* 604-5, 611-2; Dec. 14 and 21, 1929.

A mixture of ether and petroleum ether (1 to 1) is a suitable solvent for the extraction method of determining benzoic acid in jam, honey, mustard, meat, margarin, fruit sirups, and the like. A method for determination of salicylic acid is also described. For detection of formic acid and formaldehyde in vinegar, the Schiff-Elvove (fuchsine solution) reagent is quite sensitive. It could probably be adapted to a colorimetric determination also. For detection and determination of nitrates and nitrites in meat products, Tillmann's modification of the diphenylamine reaction and his method of clarification with mercuric chloride are very satisfactory for qualitative tests. For quantitative work, the more specific brucine reaction is preferable; or the Griess-Romijn colorimetric method can be used in the solution clarified with mercuric chloride after the diphenylamine test.

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COCOA BUTTER. W. Vaubel. *Chemische Umschau auf dem Gebiete der Fette 36,* 377-80; Dec. 4, 1929.

Among the fats which can be used as substitutes for cocoa butter, and are likely to appear as adulterants, are hardened coconut oil, hardened whale oil, and several vegetable fats sold under proprietary names in England and Continental Europe. There also is the ever recurring problem of the substitution of inferior cocoa butter (extracted from shells and waste) for the high-grade fat. For detecting adulteration and substitution, the bromine-iodine number of the fat, if properly determined, has a great deal of significance. It is necessary, however, in making use of this test to determine the bromine-iodine number of the fat with which comparison is desired, as well as of the fat to be analyzed. Inferior (extracted) cocoa butter can also often be distinguished from the high-grade (pressed) fat by the darker color of the extracted fat. Directions are given for proper measurement of the bromine-iodine number, and typical analyses are reported.

FLUORESCENCE OF LARD. A. van Raalte and A. van Druten. *Chemisch Weekblad 26,* 602-3; Dec. 14, 1929.

Fluorescence has been proposed as a means of distinguishing raw from refined lard, on the basis of the observation that refined lard shows a blue fluorescence in ultra-violet light, but the untreated fat does not. Further observations, however, have shown that raw lard may show a faint fluorescence, and that refined lard gradually loses its fluorescent properties as it ages. Other causes, as addition of a dye, may also destroy the fluorescence of refined lard. Hence the fluorescence test has no practical significance.

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IS IRRADIATED FARINA AS BOUGHT IN THE MARKET ENRICHED WITH VITAMIN D? F. W. Schlutz and M. R. Ziegler. *Journal of American Medical Association, 93,* 1467, Nov. 9, 1929.

Irradiated farina, as purchased in the open market and incorporated as 10 per cent of a rachitic diet, did not cure rickets in rats. The rats that received irradiated farina showed no increase in blood phosphorus and also indicated no increased calcification, hence no healing. "In view of the negative results obtained in this laboratory with irradiated farina, it does not seem possible that the claims for it are worthy," it is stated.

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FRUIT ICE CREAMS. C. R. Fellers and M. J. Mack. *Fruit Products Journal 9,* 8-12, 46-7, 106-9; September, October and December, 1929.

An experimental program has been carried out at the Massachusetts Agricultural Experiment Station on the commercial utilization of cold-packed strawberries and raspberries in ice cream. The results of the investigation indicate that the quick freezing should be effected at 0 to 10° F., and storage at about 15° F. The preferred container for sale to small ice cream factories is the enameled tin can (1 to 5 gallon sizes). For strawberries the fruit-to-sugar ratio may range from 2 to 1 to 3 to 1; for raspberries it should be 3 to 1. Corn sugar discolors the fruit, injures its texture and flavor, and is not sufficiently soluble for cold-pack use. Among the varieties of berries especially suitable for cold-packing are King Edward, Howard 17 and 25, Beacon, First Quality and Marshall strawberries, and Herbert, Cuthbert and St. Regis raspberries. For making up strawberry ice cream with the fruit, the optimum fruit content is 12 to 15 per cent, without any extract. For raspberry ice cream, raspberry extract can be successfully used and the fruit content can be lowered to 8 or 10 per cent. Use of vanilla extract in these fruit ice creams does not give any result which justifies the added cost. To bring out the best flavor, and to obtain rapid freezing and good whipping qualities, the fruit should be added to the mix just after it begins to freeze. Vanilla ice cream, made from the same

basic mix, takes a longer time than these fruit ice creams for cooling in the freezer, for whipping and for the brine flow. Cold-packed strawberries and raspberries may be considered practically equivalent to the fresh fruits for ice cream manufacture.

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FRUIT BEVERAGES. H. B. Farley. *Fruit Products Journal 9,* 110-1; December, 1929.

For pasteurizing fruit beverages, the temperature must be 175° F. for still juice, because the mold spores survive lower temperatures. In carbonated juice, however, the oxygen essential to mold growth is eliminated and the pasteurizing temperature needs to be only high enough to kill the yeast cells. For this effect a temperature of 150° F. is sufficient. Since bottlers are very desirous of avoiding even this relatively mild pasteurizing treatment, experiments were made with lower temperatures, but at 145° F. the treatment is ineffective. Therefore 150° F. must be accepted as the minimum effective temperature for 30-minute pasteurizing. Since no lower temperature is acceptable, further experiments were made on the preservation of grape juice with sodium benzoate. The standard concentration (0.1 per cent) for food preservation is objectionable in grape juice because it injures the flavor. If the juice is carbonated, however, sodium benzoate is relatively more effective, and satisfactory preservation can be obtained with 0.05 per cent or less. There is no objectionable taste in juice preserved with not more than 0.05 per cent of sodium benzoate. The experiments were made with samples which were heavily inoculated with yeast and mold. It is considered probable that the amount of infection occurring under ordinary practical bottling conditions could be satisfactorily counteracted with as little as 0.025 per cent of sodium benzoate. It must be borne in mind, however, that the higher the acidity the less preservative is needed.

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BUTTERFAT IN ICE CREAM. E. S. Chase and F. G. King. *Journal of Dairy Science 12,* 473-80; November, 1929.

A comparison has been made, based on a large number of determinations, of the modified Babcock and the Mojonnier methods for butterfat in ice cream. This comparison was of strictly factory methods, as used for standardizing ice cream mixes or for checking the standardization. The Mojonnier tests checked with each other within 0.05 per cent. Of the modified Babcock tests, 45 per cent checked with the Mojonnier tests. Assuming a permissible variation of 0.2 per cent, 86 per cent were in satisfactory agreement with the Mojonnier tests. Of the remaining 14 per cent, with variations up to about 0.5 per cent, doubt is expressed as to their usefulness in standardization. No explanation or remedy is offered for these larger deviations. The modified Babcock test is not applicable to ice creams which contain fibrous flavoring material; strawberry, chocolate and like flavors do not give satisfactory tests. The Babcock-Gerber method also was compared with the Mojonnier test. With this method, strawberry and chocolate ice creams will give a clear fat column; but the accuracy is not satisfactory. It was found that fully as much precision could be attained by reading a cream test bottle to 0.1 per cent as by using a milk test bottle (reading to 0.2 per cent) and doubling the result.

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STUDIES ON THE EFFECTS OF OVERDOSAGE OF VITAMIN D. R. F. Light, G. Miller, and C. N. Frey. *Journal of Biological Chemistry,* vol. 84, page 487, October, 1929.

White rats were used in these experiments, which conclude that excessively large doses of irradiated ergosterol must be administered before any ill effects are noted. Dosages as high as 10,000 times the daily curative dose given over a period of 6 months had no deleterious effects, although dosages of 100,000 times the daily curative dose produced various ill effects and eventually death. Excessive amounts of vitamin D cause a decrease of the body's mineral reserve, with a relatively greater elimination of phosphorus than of calcium.

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PECTIN JELLIES. Gene Spencer. *Journal of Physical Chemistry 33,* 1987-2011, 2012-20; December, 1929.

To explain the formation of jellies in pectin-sugar-water systems it is shown that there are two concentration ranges (one acid and one alkaline) in which a pectin-sugar solution will set to a jelly. Between these ranges is a range in which the pectin will form sols, not jellies. Each fruit has its own specific values for the gel-sol boundary lines. Of the fruits studied, cranberries had the largest jelly field. The field was smaller for apples, and still smaller for strawberries and elderberries. Low pectin content accounts for the small jelly field in strawberries; in elderberries probably salts or protective colloids are present which stabilize the sol. The smaller the jelly field the more likely the operator is to miss it, and end in a concentration range in which only a sol is stable. In the jelly field of every fruit, there is a combination of sugar and acid concentrations for a jelly of whatever characteristics may be desired for practical purposes. The proper combination can be ascertained with some precision by proper use of commercial pectin and adjustment of recipes to the known characteristics of a given fruit. Some causes of failure in jelly making are discussed in the light of the gel-sol boundary hypothesis, and it is shown that the hypothesis can be successfully applied even to the problem of remaking a jelly after it has set. A study also is made of the known peculiarity that some salts (e. g., sodium chloride) retard jelly formation, while others favor it (e. g., calcium chloride). The conclusion is that some kinds or concentrations of salts lower the sugar jelly boundary of a given pectin sol and so favor jelly formation; others raise the boundary curve and so hinder jelly formation by decreasing the size of the jelly field.

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EFFECT OF HYDROGEN ION CONCENTRATION IN THE DYEING OF CHERRIES. R. N. Jeffrey and W. V. Cruess. *Industrial and Engineering Chemistry,* vol. 21, Dec. 1929, p. 1268.

Of the three dyes commonly used in the coloring of Maraschino style cherries, Ponceau 3R and Amaranth are not appreciably affected by the pH value and bleed rapidly. Erythrosine, however, is affected greatly by the pH value and it is recommended that it be applied in dilute sodium bicarbonate solution of approximately pH 7.5, and be fixed by dilute citric acid or other permissible fruit acid at approximately pH 3.0-3.5.

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PRESERVING FRUITS AND BERRIES BY FREEZING. J. M. Hartley and C. A. Glabau, *Bakers Weekly,* vol. 64, Dec. 7, 1929, p. 66.

If fruit is kept in the frozen state, a minimum quantity of sugar is sufficient. Sugar sirup is preferable to the crystallized form because it has less tendency to settle in the container. A freezing temperature of 5° to 10° F. often is used, while in other plants a sharp temperature of 8° F. is used for freezing. Ripe fruit should be used, and it is better that it be over-ripe than under-ripe when preserved by freezing.

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FOOD HANDLING HAZARDS. D. S. Beyer and Robert Clair. *Bakers Weekly,* vol. 64, Nov. 30, 1929, p. 68; Dec. 7, 1929, p. 75.

Specific plant conditions and accident causes in a typical food plant are discussed. Handling of material accounts for about 60 per cent of both accident frequency and lost time of the particular plant. The outstanding causes of material-handling accidents are strains and hernias from lifting, and accounted for more than a third of the time lost. Slipping, tripping, and falling are often due to hazardous conditions of poor housekeeping.

* * *

SOME OBSERVATIONS ON THE BAKING TEST. "Micros" in Milling. *Northwestern Miller,* vol. 160, Nov. 20, 1929, p. 647.

The scientific baking test carried out with a definite object in view is the most useful one possessed. The "variable" type of baking test is carried out by varying the three factors, absorption, fermentation, and handling, in order to produce the best possible loaf the flour is capable of yielding. The "fixed" type of baking procedure aims to maintain unalterable all the variables but the flour, and enables the operator to concentrate on studying the uniformity of the flours produced. Both tests are discussed in detail.

Critical Book Reviews

MILK AND MILK PRODUCTS. By C. H. Eckles, W. B. Combs and H. Macy. McGraw-Hill Book Company, Inc., New York City, 1929. 379 pages. Price, $3.50.

THE authors, professors at the University of Minnesota, have prepared this as a text book for the introductory course in dairying at agricultural colleges. It covers, generally, the chemistry and bacteriology of milk; its use as food; its manufacture into butter, cheese, ice cream, canned and dried milk; market milk, testing and dairy arithmetic. The book is written from the academic viewpoint, and is not likely to be of any particular value to the man in the industry.

Unfortunately, the student will not get an entirely accurate idea of the industry from this book. For example, the use of casein for sizing paper, which probably accounts for about 75 per cent of the domestic production, is mentioned only in the legend of an illustration, while it cannot be said to be "used extensively" in leather manufacture. Wisconsin producers estimate that 75 per cent of their cheese is ground, yet process cheese is dismissed in a paragraph, while the history of the development of the separator occupies about 8 pages. The chapter on condensed, evaporated, and dried milk is neither clear nor accurate. Some of the physics and chemistry in the chapter on "Properties of Milk" also is inaccurate.

The style is not always lucid, a variation possibly due to the triple authorship, but hard on the student. The book is well and modernly illustrated, but the proof reading is rather poor.

F. L. SEYMOUR-JONES.

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CANE SUGAR HANDBOOK by Spencer and Meade. John Wiley & Son. Price, $6.

IT IS not often that any handbook has a life of 40 years. This book, however, was born just 40 years ago and has been re-edited seven times. So necessary has it proved to be that its presence in every sugar laboratory is taken for granted. Much of this long life has been due to the excellent printing which the book has always had, and also to the fact that during his lifetime, Dr. Spencer was in the habit of issuing a new and revised edition whenever advances in knowledge of sugar chemistry made it necessary to do so. This seventh edition probably would have been issued several years ago had it not been for Dr. Spencer's death in 1925. As the demand for a new edition became more and more imperative, considerable difficulty was experienced in finding a man to do the work. The choice of George P. Meade has proved most fortunate.

The present edition shows a thorough knowledge of the literature and a very painstaking attention to detail. Each of the chapters has been rewritten, and several of the chapters are practically new. In all cases the additions have been judicially and admirably made, which has resulted in bringing the book up to date in a manner which is exceptionally adequate. For instance, all the new Spencer apparatus is diagrammed and described; the dye-test method; the conductivity method for ash; the pH determination, and the various comparators; the determination of color by the various colorimeters—these are all described in sufficient detail for most practical purposes, with references for the man who wishes a more detailed discussion.

Perhaps the most important part of Spencer has been the excellent set of tables at the end of the book. In this edition these tables have been revised and corrected according to the most recent publications. For instance, Table 14 is corrected to 1928.

Ordinarily it would be sufficient to say that this edition of Spencer is as good as the old Spencer. Mr. Meade, however, is to be congratulated upon making the last edition the best of all.

CHARLES E. COATES.

* * *

THE NEWER KNOWLEDGE OF NUTRITION. By E. V. McCollum, Ph.D., Sc.D., and Nina Simmonds, Sc.D. (Hygiene). The Macmillan Company, New York, 1929. New Fourth Edition, 594 pages. Price, $5.

FOR the food manufacturer interested primarily in nutritive values, this is one of very few books that are sufficiently comprehensive in scope to be of general interest. In 1918 the authors prepared a small volume, in lay English, consisting of brief recapitulations of all fundamental research having to do with vitamins and their influence in the diet. Because of advances made by nutritional scientists throughout the world, it was necessary to rewrite the text in 1922, 1925, and 1929—the present edition including examinations of literature published up to May, 1929.

Laboratory work with rats or guinea pigs—the so-called biological analysis—is coupled with text descriptions of human dietaries. These are confirmatory of conclusions based upon the gain or loss in weight of the diminutive animals undergoing experimental diets.

Dr. McCollum is well qualified to speak on this topic. He is the recognized authority on certain of the vitamins, was instrumental in giving these food accessories their present names, and as professor of chemical hygiene at Johns Hopkins is constantly adding to our present knowledge concerning them.

In this edition appear discussions of the rôle played by the several vitamins in the prevention or treatment of anemia, goitre, pellagra, and rickets. In connection with the malady last named there is recited the interesting story of the discovery of ergosterol, the mother substance of the anti-rachitic vitamin D. As might be expected, much space is devoted also to ultra-violet rays—the means by which ergosterol is activated.

Those who, like Dr. McCollum, insist upon the dietary importance of the vitamins, have the support of practically all scientists. Their case is well buttressed with valid argument based upon demonstrated fact, a state of affairs that is likely to have notable effect upon our diet in the years to come.

Nor should that be taken to mean that we are to be counseled to revert to nature and emulate the dietary habits of Neanderthal man—or of the lordly lion, as described so graphically on page 445. The back-to-nature school is confronted by the fact, among others, that breast milk is very low in vitamin D, which explains the occurrence of rickets in breast-fed infants. Truly, the ideal diet of the future is quite as likely to call for further processing as for a minimum of fabrication.

R. G. GOULD.

* * *

CHEMICAL ENGINEERING CATALOG. Fourteenth Annual Edition. 1929. Published by Chemical Catalog Company, Inc., New York City. 1,205 pages. Prices: To those with responsible positions in the chemical industry, free on the understanding that it is to be returned with the publication of the next edition; $3 for permanent possession. To others, $10.

THIS well-known catalog of chemicals and chemical engineering equipment is compiled under the supervision of the American Chemical Society, the American Institute of Chemical Engineers and the Society of Chemical Industry. It contains considerable information of interest to those concerned with the manufacture of foods and beverages. The 1929 edition is divided into four sections; (1) A trade name index; (2) equipment section; (3) chemicals and materials section, and (4) a technical books section in which more than 2,600 volumes are listed.

The volume is standardized as to typographical arrangement, so that its characteristics as an advertising medium do not limit its usefulness as a reference book. The indexing is thorough and logical. Products of more than 700 manufacturers are included in the volume.

A COMPREHENSIVE SURVEY OF STARCH CHEMISTRY—Vol. 1. Compiled and Edited by Robert P. Walton. Chemical Catalogue Company, 1928. 240 pp. of symposium and 330 pp. of references. Price, $10.

THE title of this volume is well chosen, for it is a voluminous survey of the chemistry of starch. The preface of the book could be taken as an excellent review, as the compiler recognizes the difficulties of his task in bringing together the conflicting views of the contributors to the symposium on starch.

It is clearly evident that the last word has not been said on starch chemistry. It is also apparent that an enormous amount of work has been expended in pure researches on, and the practical application of, starch and its conversion products.

The names of the authors of the various papers contributed to the symposium guarantee intelligent treatment of the subjects discussed—which are numerous.

The reviewer was much surprised to note the absence of a paper dealing with the general subject of the acid hydrolysis of starch, not only on account of its vast importance in industrial applications but also its scientific value on the chemical aspects of starch transformation products.

True, anyone interested in the subject could look up the many references in the voluminous and very satisfactory bibliography which comprises about two-thirds of the volume, but the reviewer feels that a comprehensive survey of starch chemistry is not complete unless it includes a chapter on the acid hydrolysis of starch.

This volume should find a place in every reference library, and in every laboratory, for starch is distributed exceedingly widely in nature, and its conversion products find innumerable technical uses. It is a satisfaction to have such a mass of information brought together in compact form for convenient reference. GEORGE DEFREN.

* * *

THE GRINDROD IMPACT STERILIZER. By G. J. Hucker and Alice M. Hucker. Bulletin No. 153, The New York Agricultural Experiment Station, Geneva, N. Y. August, 1929.

THE METHOD of sterilizing milk by fine jets of high-pressure steam that has been called the Grindrod process attracted considerable attention on account of the rapidity with which milk could be sterilized by this method and the novelty of the theories advanced by its inventor and by others to explain its action. Those who have doubted the claims made for it will read this bulletin with much interest, for the authors have found that in the Grindrod sterilizer a temperature of 230° F. for 1 to 2 minutes suffices to eliminate all non-thermophilic organisms from milk and that thermophilic heat-resistant bacteria were destroyed in from 3 to 5 minutes at 240° F.

But they also find that thin films of milk subjected to similar temperatures and pressures in an ordinary laboratory autoclave exhibit a similar sterilizing effect, of practically the same rate as the Grindrod sterilizer. These observations lead to the conclusion that this process is an unusually efficient method of heat application. Physical destruction of the bacterial cell seems to play no part in the process.

Although the cream line is destroyed and a slight boiled flavor is conferred upon the milk, the process appears to have certain industrial advantages, particularly for the production of dried milks, condensed milk, and certain sections of the butter industry.

◂◂ Government Publications

DOCUMENTS ARE AVAILABLE, *at prices indicated, from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.*

Sugarcane Studies. Two documents of the U. S. Department of Agriculture: Variety Tests of Sugarcanes in Louisiana During the Crop Year 1927-28, by George Arceneaux and F. D. Stevens, Circular 88, 5 cents; and Rate of Deterioration of Sugar Content of some P.O.J. Sugarcane Varieties in Louisiana, by G. B. Sartoris, Circular 97, 5 cents.

Miscellaneous Food Statistics, pamphlet from the Census of Manufactures, 1927. Five cents. Includes production statistics for 1927 on coffee and spice, roasting and grinding; food preparations not elsewhere classified; macaroni, spaghetti, vermicelli, and noodles; peanuts, walnuts, and other nuts, processed; rice cleaning and polishing; and vinegar and cider.

Sausage and Meat Proteins, by Ralph Hoagland and George C. Snider. Reprinted from the U. S. Department of Agriculture *Journal of Agricultural Research,* Volume 39, No. 7; Oct. 1, 1929. An experimental study of nutritive value of proteins in certain kinds of sausage and other meat food products.

Care of Milk, revised by R. P. Hotis. U. S. Department of Agriculture Farmers' Bulletin 976. Five cents. A document suitable for distribution by milk-products plants to farmers supplying milk and cream.

Properties of Sugar Solutions. Bureau of Standards Circular 375. Five cents. Gives weights per United States gallon and weights per cubic foot of sugar solutions.

Agricultural Workers Directory. U. S. Department of Agriculture Miscellaneous Publication 63. Fifteen cents. List of technical workers in the Department of Agriculture and outline of department functions, 1929.

Soybean Production, by W. J. Morse. U. S. Department of Agriculture Farmers' Bulletin 1605. Five cents. Information for the farmer, supplementing the earlier Farmers' Bulletin on culture and varieties of soybeans, of interest to those developing the soybean products industry.

Glass Container Sizes. Bureau of Standards Simplified Practice Recommendation R91-29. Five cents. Standard specifications for glass containers for preserves, jellies, and apple butter.

South American Food Market, by Trade Commissioner H. P. Macgowan. Bureau of Foreign and Domestic Commerce Trade Information Bulletin 662. Ten cents. An analysis of the food market in Colombia.

Tomato Products. U. S. Tariff Commission document. Fifteen cents. A report to the President of the United States on differences in costs of production on canned tomatoes and tomato paste in the United States and in the principal competing country, as ascertained pursuant to the provisions of Section 315 of Title III of the Tariff Act of 1922.

Corn and Corn Products Statistics. U. S. Tariff Commission document. Twenty cents. A report to the President of the United States on differences in costs of production of corn or maize in the United States and in the principal competing country, as ascertained pursuant to the provisions of section 315 of Title III of the Tariff Act of 1922.

Cod-Liver Oil, by John Ruel Manning. Bureau of Fisheries Document 1065. Ten cents. Bibliography on cod-liver oil in animal feeding, with non-critical comments and abstracts.

Fishery Industries of the United States. Bureau of Fisheries Document 1067. Thirty-five cents. A statistical review for 1928.

Shipments of Fruits and Vegetables. U. S. Department of Agriculture Statistical Bulletin 27. Twenty-five cents. Statistics on car-lot shipments of fruits and vegetables from stations in the United States for the calendar years 1926 and 1927.

Selected Patents

Coating Confectionery With Chocolate—George R. Baker, London; James W. Epps, Warlingham, and George W. Perks, Southport, England, to Baker Perkins Company, Inc., New York City. No. 1,737,447. Nov. 26, 1929—A more brilliant gloss on candy that is mechanically coated by passage through a stream of chocolate on a moving belt or conveyor is obtained by cooling the outer side of the chocolate stream. This produces a "grained" or partly crystallized portion which forms the surface layer of the chocolate coating, thus causing the candy to solidify from the exterior inward. One of the forms of ap-

paratus for accomplishing this operation is shown in the figure. The tank contains chocolate kept in a molten condition by the jacket (1). On the right side of the tank, cooling coils (2) cause a portion of the chocolate to solidify, and the molten chocolate running from the container is cooled and partly "grained" by the cooler solid material. In another modification, cool air is blown against one side of the strip of chocolate as it drops from the opening.

* * *

Continuous Process for Ice Cream Hardening—Clarence W. Vogt, Louisville, Ky., to Vogt Instant Freezers, Inc., Louisville, Ky. No. 1,733,740. Oct. 29, 1929—The ordinary hardening room in which plastic and semi-frozen ice cream is frozen by batch operation is replaced by the apparatus shown in Fig. 1. As the ice cream comes from the freezer (1), it enters a reservoir (2) equipped with a scale operating an electric relay. This operates a valve in the vacuum delivery pipe (3), automatically closing it when a supply of the mixture is not present. The chamber (4) is refrigerated by the usual system of brine pipes. The incoming mixture is conducted into the discharge header (5) and discharged on the top of two revolving rolls (6) through which refrigerant brine is being passed. (See Fig. 2.) The proximity of the two rolls gives a standard thickness, assuring even and complete freezing. As shown in Fig. 2, knives with scalloped edges and a reciprocating motion cut the ice cream, now hard frozen, from the rolls. It then falls upon a conveying belt, further hardening taking place because of the cold air in the room. The material is fed from this belt to the feeding and compression chamber (7), where a screw feed forces it into the desired container. A vacuum is maintained in the upper portion of the room by the vacuum pump (8), located in the refrigerated room so that there will be no loss of cold air. The vacuum causes the plastic material to flow out onto the rolls.

* * *

Helix Holder for Pasteurization — Joseph H. Godfrey, Chicago, Ill., to Creamery Package Manufacturing Company, Chicago, Ill. No. 1,734,570 and No. 1,734,571—Continuous, automatic regulation of the holding period in the pasteurization of milk is obtained by the use of apparatus in which the

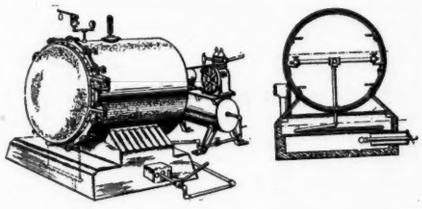
milk passes through a helical coil. The helical coil is wound on a central shaft to form a cylinder, jacketed to conserve heat. Separate batches of milk are carried in the lower portions of each turn of the helix, one turn being emptied with each revolution of the cylinder. Length of the holding period is regulated by controlling the speed of rotation. (Note: One type of this apparatus now on the market was described in the December issue of FOOD INDUSTRIES.)

* * *

Preparing Fruit Sirups — Ludwig Kuntz, New York City, to Lash's Products Company, San Francisco, Calif. No. 1,735,118. Nov. 12, 1929—Deterioration of ordinary fruit sirups caused by the action of the fruit acid in the juice upon the essential oil derived from the rind is prevented by preparing two separate sirups, one from the juice and one from the rind, which are mixed only shortly before use. Lemon sirup prepared by this method is said to keep many months, in contrast to a period of two weeks for a sirup containing a mixture of acid and flavoring principle from the rind.

* * *

Oven for Baking Hams and the Like —Charles L. Thomas, Dallas, Texas, to Charles L. Thomas Company, Inc., Dallas, Texas. Oct. 22, 1929. No. 1,732,289 —Hams and similar foodstuffs are baked in an airtight and insulated vessel by the admission of heated com-



pressed air. As shown in the illustration, air is taken from an outside source, heated in a coiled pipe, and forced into the cooker under pressure. In baking hams, a pressure of about 40 pounds is maintained, the temperature of the air being about 175° F. By introducing smoke, etc., with the compressed air, flavor may be controlled. All loss of natural juices is prevented, the inventor claims.

* * *

Adding Mineral Salts to Sugar — Viggo Julius Andresen, Oslo, Norway. No. 1,732,492. Oct. 22, 1929—A colloidal solution of calcium or other mineral salts is distributed in sugar, candy, or other sugar products to supply the ordinary dietary deficiency of these substances. The fact that lime compounds suitable for such use ordinarily are not readily soluble, and so difficult to distribute uniformly throughout the product, is overcome by using a lime salt of low solubility (such as calcium saccharate) together with an acid phosphate, the reaction resulting in the formation of a colloid evenly distributed in the product. Fishbone meal, which in itself contains the constituents necessary to form a colloid of this type, may also be used.

* * *

Removing Spray Residue From Fruits —Irving F. Laucks, Harry P. Banks, and Hugh F. Rippey, Seattle, Wash., to Laucks Laboratories, Inc., Seattle, Wash. No. 1,732,816. Oct. 22, 1929—Spray residue of various kinds usually is inseparable from the natural wax coating of the fruit, so that wiping methods are not fully successful in removing it. By washing the fruit in a solution containing 1 to 10 per cent trisodium phosphate, the wax is emulsified and both it and the spray residue are removed. Other mixtures of mildly alkaline salts also may be used. Following washing, the fruit is coated with sulphurized paraffin to replace the natural wax in sealing the pores and to inhibit mold development.

Fig. 1

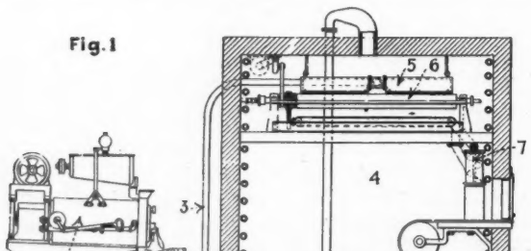
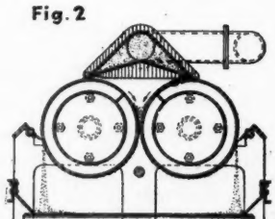
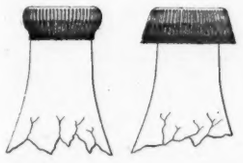


Fig. 2



Preventing Mold Development on Fruit—Ernest M. Brogden, Santa Monica, Calif., to Brogdex Corporation, Winter Haven, Fla. No. 1,732,118. Oct. 15, 1929—Blue Mold and similar organisms are removed from citrus fruit by washing in a suitable mold-inhibiting bath as it comes to the packing house. Sodium hypochlorite, borax and sodium carbonate are some of the materials which may be used in the bath. After being so treated, the fruit is dried, the dry salt deposit remaining from the bath is brushed off, and the fruit is sprayed and brushed with a very thin layer of paraffin thinned with a suitable solvent.

* * *



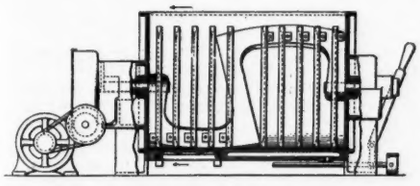
Heat-Detecting Milk Bottle Cap—Carleton Ellis, Montclair, N. J., to Ellis-Foster Company, New Jersey. No. 1,730,564. Oct. 8, 1929—A hood cap of stiff paper has its sides crimped against the mouth flange of the bottle. It is held in place by being coated with a binding agent which has the property of retaining its strength only at a satisfactory temperature. The preferred binding compound which unseals when the temperature of the milk reaches about 85 deg. F., is composed of rosin, paraffin and carnauba wax. This cap may be used over the ordinary inside disk closure, or alone if properly constructed.

* * *

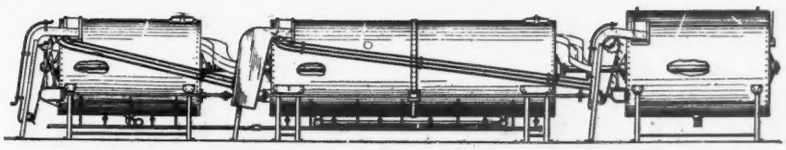
Speeding the Dough Period in Bread Making—Curtis J. Patterson, Kansas City, Mo., and C. G. Harrel, Liberty, Mo., to Bakeries Service Corporation, Delaware. No. 1,722,677. July 30, 1929—A process in the manufacture of bread in which a suitable organic acid—tartaric, lactic or citric—is added to bring the gluten to the optimum condition by the time the mixing operation is completed. The correct amount of acid to be added is calculated from hydrogen ion concentration determinations made on the flour and on the dough.

* * *

Apparatus for "Conching" Chocolate—W. E. Prescott and J. P. Bunce, London, England, to Baker-Perkins Company, Inc., Saginaw, Mich. No. 1,727,444. Sept. 10, 1929—Apparatus for "conching" chocolate in which a number of annular blades, either perpendicular to the shaft or forming helices of small pitch, are attached to the mixing blade.



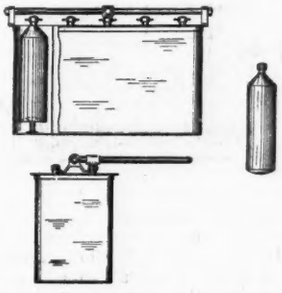
These additional annular blades serve to divide the chocolate more efficiently and cause a rubbing contact of the chocolate upon itself due to its tendency to stick to the surfaces as they revolve. It is claimed that the operation is completed more rapidly than formerly. The figure shows a longitudinal view of the apparatus.



Variable-Time Cooker for Canneries—George E. Gardner, San Jose, Calif., to Sprague-Sells Corporation, Hoopeston, Ill. No. 1,735,242. Nov. 12, 1929—In canneries where a number of cooking and cooling units are assembled in tandem and operated from a single source of power, it is sometimes desirable to pass different products through the same cooking apparatus, varying the temperature and time of cook to suit each group. By using two compartments of a different length and a number of can-ways through which the path of travel can be varied, a number of combinations of time and temperature are possible. For instance, some cans, requiring a short cook, go through the first chamber only, those requiring a medium cook go through the second only, and those requiring a long cook go through both. Regulation of temperatures in the two cookers gives further variation. The illustration shows the two cookers and a cooler connected in tandem.

* * *

Pasteurizing Carbonated Beverages—Frederik Lassen, of Copenhagen, Denmark, to Aktieselskabet de Forenede Bryggerier, of Copenhagen. No. 1,724,291. Aug. 13, 1929—Carbonated beverages such as beer are pasteurized in completely filled aluminum containers having flexible bottoms that are able



to expand and contract so that the container may be entirely filled with liquids without leaving a head space.

* * *

Sand Blast Cleans and Thins Nut Shells—Hugh F. Rippey, Seattle, Wash., to Laucks Laboratories, Inc., Seattle, Wash. No. 1,733,697. Oct. 29, 1929—Discolorations and stains can be removed from the surface of nut shells without washing or bleaching, or a nut having a thick shell can be made to approximate "paper" shell varieties, by the use of a sand blast. The process is said to be cheaper than chemical bleaching of shells, and the danger of injury to the kernel is eliminated. Both the process of sand-blasting the nuts and the article so produced are covered by the patent.

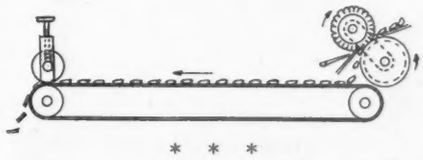
* * *

A Food Product of Cheese and Chocolate—Louis Shostak, Chicago, Ill., to F. Peter Dengler, Inc., Chicago, Ill. No. 1,735,510. Nov. 15, 1929—Cheese is ground and melted, an emulsifying agent, such as sodium phosphate, is added, and the melted material mixed with from 5 to 25 per cent of chocolate. The mixture is held at a temperature from 140 to 200° F. and stirred for about half an hour before being allowed to solidify. All types of cheese are covered by the patent, but full cream cheese containing from 20 to 30 per cent butter fat is said to give a delicious product.

* * *

Inspecting the Interior of Figs—Thomas W. W. Forrest, Fresno, Calif., to California Peach and Fig Growers' Association, Fresno, Calif. No. 1,729,611. Oct. 1, 1929—The outer surface of dried figs is often deceptive, and the apparatus patented furnishes a method by which the interiors may be inspected before packing to detect products with infected interiors. A roll equipped with a series of cutting blades opens slits in the figs as shown on the left.

After passing along an inspection belt, the slits are closed by an adjustable pressure roll, as shown below.



* * *

Treating Citrus Fruits While Frozen—Earl P. Stevenson, Newton, Mass., to Arthur D. Little, Inc., Cambridge, Mass. No. 1,731,476. Oct. 15, 1929—Essential oil, pectin and citric acid are recovered from citrus fruit by treating it while in a frozen condition. Before or after freezing at temperatures down to 0 deg. F., the outer cell layer containing the oil is removed mechanically. The action is said to be more rapid when the fruit is first frozen. The frozen fruit is then placed in a crusher or impact mill and disintegrated. The albedo, or white peeling layer, breaks off in relatively large pieces, and the frozen cell contents are reduced to a granular state. They are separated by screening while frozen. Among the advantages claimed for the process is the fact that absorption of the juice by the albedo is avoided, thus facilitating the drying of this layer for the recovery of pectin and preventing waste of the citric acid contained in the juice.

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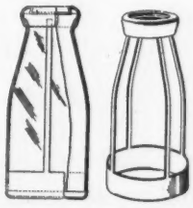
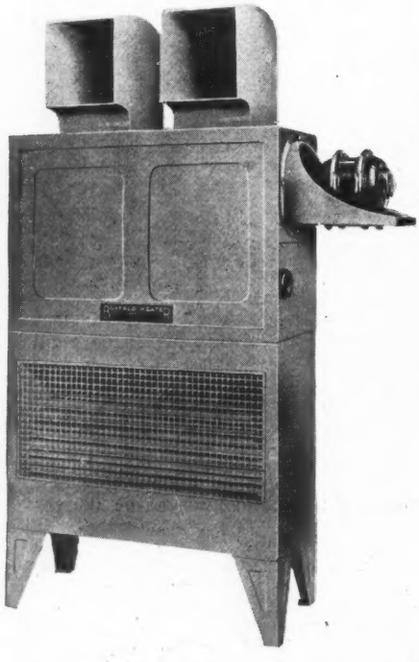


Paper Milk Bottle—Fred Alden and Louis M. Cooney, Saginaw, Mich. No. 1,733,571. Oct. 29, 1929—This milk container of destructible material is made in two parts. A rigid cardboard frame made as shown in the illustration supports a transparent container within it. A similar arrangement in which the transparent container is outside the frame also is covered by the patent.

◂◂ Manufacturers' News And Equipment

Unit Heater Washes And Humidifies

THE "Buffalo Wetboy," a new-type unit heater now being manufactured by the Buffalo Forge Company, Buffalo, N. Y., humidifies the air which it heats by means of scrubber blades dipping in a water tank, providing a wetted surface through which the air must pass twice. The unit adds about 25 to 35 per cent moisture to the air, according to the manufacturer.



In addition to the humidifying feature, 70 per cent of the dirt and dust in the air is removed by the washing action. The heater is compact, requiring no more space than the standard "Buffalo Highboy" heaters. The heating element is made up of "Universal Aerofin" tubing for pressures from 2½ to 200 pounds gage.

Acid Proof Centrifugal Pumps

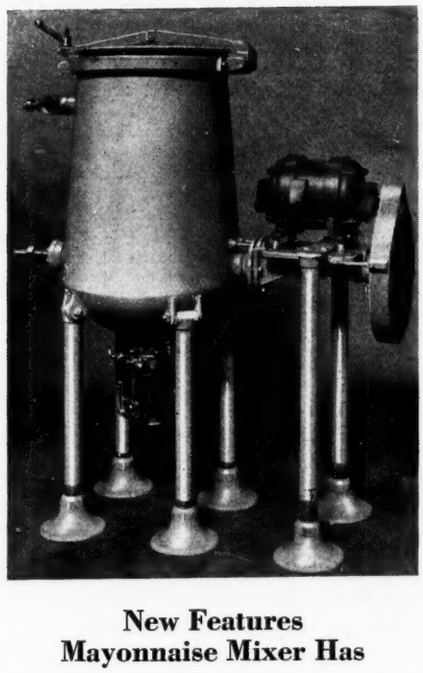
A LINE of centrifugal acid pumps (Chemical Stoneware Lined) has been made available with efficiencies approximately those on all-metal pumps under similar conditions. The design is along correct hydraulic lines and embodies modern improvement and refinement, as suggested by ceramists and hydraulic engineers. The pump is the "U. S. Standard" centrifugal acid pump (chemical stoneware lined), manufactured by The U. S. Stoneware Company, of 50 Church Street, New York City.

These pumps are stated to be absolutely incorrodible. The casing, impeller and all parts coming in contact with the liquid are built of guaranteed acid-proof chemical stoneware. There are no parts to be eaten away, no replacements, and no contamination of liquids. "U. S. Standard" centrifugal acid pumps are recommended for the handling of all acids, alkalis, chemicals and corrosive solutions, weak or strong,—the sole exception being hydrofluoric acid. Some applications of especial interest to food manufacturers follow:

Mixed Acids	Pharmaceuticals
Vinegar	Fruit Acids
Alum Solutions	Chlorinated Brines

Liquid Food Products

The pumps are offered in two standard sizes: No. 1 with a rated capacity of 225 g.p.m. and No. 2 with a capacity of 500 g.p.m.



New Features Mayonnaise Mixer Has

A NEW glass-lined mayonnaise emulsifier has recently been developed by the Pfaudler Company, Rochester, N. Y. It is built of ¼-inch steel and lined with acid-resisting glass enamel. The mixer has an actual capacity of 50 gallons and a working capacity of 35 gallons. Vibration is said to be completely eliminated in the machine, which is equipped with a 6-arm wire beater instead of the former claw type.

The manufacturer states that the apparatus will produce in 18 minutes a heavy mayonnaise of such a viscosity that the use of air pressure to empty the tank is necessary. Other features include the simplified 4-inch outlet flush valve, and the spring-balanced cover.

◂◂ Manufacturers' Publications

Valves. Electric Valve Manufacturing Company, 68 Murray Street, New York City. —Bulletin 100, treating packless-type solenoid valves for purposes of automatic control.

Glass-Lined Mixing Equipment. The Pfaudler Company, Rochester, N. Y.—Catalog No. 702, 20 pages describing in particular the glass lined mixing equipment used for making sirups for the beverage trade.

Material Handling Equipment. Lewis-Shepard Company, 16 Walnut St., Boston, Mass.—Circular entitled "Jack Lift and Stacker Practice," describing various forms of Lewis-Shepard lift trucks, portable elevators, skid platforms, steel storage racks and similar industrial equipment.

Marshmallow Manufacture. Coignet Gelatines, 17 State St., New York City.—Twelve-page booklet discussing marshmallows and the relationship of gelatin to their manufacture.

Motors. Century Electric Company, 1806 Pine St., St. Louis, Mo.—Pamphlet describing the Century low-starting-current, normal-torque, squirrel-cage induction polyphase motor. This type is known as "SCN."

Ethylene. The Matheson Company, North Bergen, N. J.—Small folder describes fruit ripening by ethylene and gives details of tanks for shipment of ethylene a price list.

Activated Carbons. Industrial Chemical Sales Company, New York Central Bldg., New York City.—Eleven-page booklet describing the uses of Nuchar activated carbon for decolorizing and deodorizing oils and fats and greases.

Tanks, Trucks and Trailers. The Pfaudler Company, Rochester, N. Y.—Bulletin 707, describing the 1930 Pfeatherwate glass-lined truck tank for use in transporting liquids on motor trucks and trailers.

Nickel. The International Nickel Company, Inc., 67 Wall St., New York City.—A summary of advertisements of manufacturers who have featured Monel metal and pure nickel construction in their equipment useful as a source of reference.

Paint. Alfred Hague & Company, Inc., 130 W. 42d St., New York City.—Circular describing Rubalt, a new waterproof, rust-proof and acid resistance paint which is a combination of rubber and bitumen.

Electric Heating. National Electric Heating Company, 420 Lexington Ave., New York City.—Bulletin No. 822, describing high temperature liquid heating without fire or pressure. Also reprints from *Industrial and Engineering Chemistry*, June, 1929, entitled "Electrical Heating by the Container-Resistance Method," by R. A. Carleton of the National Electric Heating Company.

Practical Operating Details

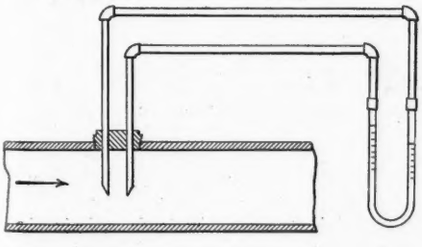
Comparative Indication of Flow Through Systems

By Fred Enmarr
Dayton, Ohio

VERY OFTEN it is desirable to know the distribution of fluids through several lines or processes of a parallel or multiple system of operation. Familiar examples of such layouts are: air supplied to a number of furnaces, ejectors, or other operations of several units each; liquids flowing to or from similar apparatus; gas going through scrubbers, washers, purifiers, and so on, or to points of consumption.

A very simple method for deriving the flows through the various lines is by means of home-made Pitot tubes and U-gages. If these lines are all alike in size and arrangement, the deflection of the U-gage gives direct indication of the actual flow.

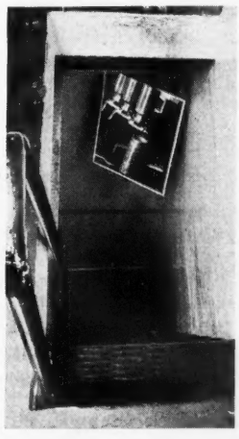
The illustration shows the form of tube used by the writer. A pair of $\frac{1}{8}$-inch or $\frac{1}{4}$-inch brass tubes, depending on the size of line, are cut at a 60° angle at one end and threaded at the other. These are screwed into the inside of a suitable sized pipe plug which has been drilled and tapped from both sides. The length of the tubes is such that when the plug is screwed into the pipe line, the center of the elliptical opening is exactly at the center of the pipe line—i.e., at the center of the flow. The cut ends face up and down stream.



The external connections are run to a U-gage containing a suitable medium — mercury for liquids, light oil for gases, and so on. Where the flow of gases is of low velocity, differential or two-liquid gages can be utilized. The flow will be indicated by the square root of the deflection or differential pressure obtained. The U-gages can be calibrated to give the actual flow in the proper units. Recording differential gages can be substituted for the U-gages and recording meters thus devised. As a specific example, an arrangement of Pitot tubes was used on 4 water pumps that supply a large water tank. At times we could get more water with 2 pumps in good condition than all 4 pumps with worn impellers. These gages and Pitot tubes told us at once which pumps were giving us water and which needed repairs.

Seeing Around Corners

BY PLACING a large mirror at the foot of the stairs leading from the freezing room to the can filling department on the floor below, the freezer



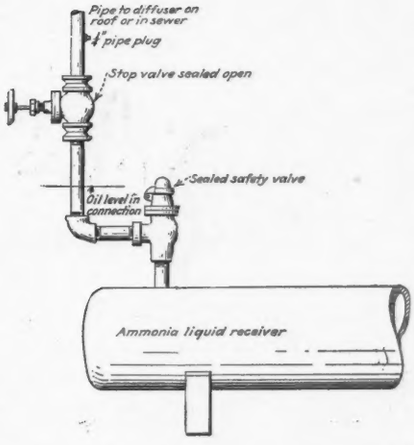
operator at the plant of the Hages Ice Cream Company, San Diego, Calif., is able to observe the progress of the filling operation and regulate his freezing accordingly. No detailed explanation is necessary, as the photograph shows perfectly the freezer-operator's view of the can-filling equipment.

Keeping Safety Valve Safe

By Robert S. Wheaton

HERE is a way to prevent the inside parts of an automatic pressure release valve from rusting. These valves are usually required by law on commercial refrigerating plants of more than a few tons capacity, and as they are usually arranged with a pipe connection to the roof of the building, terminating in a diffuser, moisture in sufficient quantities to cause rust will find its way inside of the pipe and into the valve.

Before the stop valve is built into the line, ice-machine oil is poured into the pipe nipple until the level of the oil is high enough to submerge the interior parts of the safety valve above its seat.

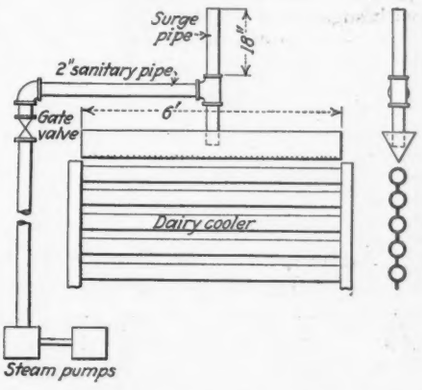

Pipe to diffuser on roof or in sewer
¼" pipe plug
Stop valve sealed open
Sealed safety valve
Oil level in connection
Ammonia liquid receiver

Air and moisture will thus be excluded and the valve will remain in first-class condition. A $\frac{1}{4}$-inch plug is inserted in the pipe line to the diffuser. Should there be any suspicion that the safety valve is leaking, a check can promptly be made by removing the pipe plug and determining if there is any ammonia odor in the pipe.

Gently Flowing Streams From High-Velocity Pipes

TO DELIVER a gently flowing stream from pipes containing swiftly moving liquids is a problem the solution of which not only makes for savings of materials but also for cleanliness. At one plant a sauce was delivered to the trough of a dairy type cooler from a 2-inch pipe after elevating it about 20 or 25 feet by a steam pump. The situation required throttling the flow to suit the rate of use. Various methods were tried to avoid splashing, which ultimately resulted in the location of pipes and valves as indicated in the figure.

One serious difficulty was the occasional entrainment of air which caused coughing and splashing at the delivery



pipe. This was avoided by the use of the surge pipe as indicated in the drawing. Placing the controlling valve so far from the outlet was necessary so that when it was partially opened the high velocity of the escaping stream would be transformed to a gently flowing liquid.

News of the Month

Cleanliness Plays Big Part in New Fruit-Juice Process

MUCH of the success that has come to the methods of preserving orange and other fruit juices developed by the A. C. Whitefield Citrus Products Company appears to be due to plant conditions that are as nearly sterile as is humanly possible. In the plants at Fullerton, Calif., and Bradinton, Fla., where commercial production is now being carried on after 14 years of experimental work, the technique and equipment used to assure minimum contamination seem to overshadow the "electro-vacuum" sterilization process, in which the juice is subjected to mild heat under reduced pressure.

Only sound fruit are used. After the oil-cell layer is removed by peeling, the oranges are heavily steamed and then pressed. The pressing rolls are silver plated and tightly inclosed. In fact, the juice never leaves a closed system from the pressing rolls to the vacuum-filling machine, where it is put into hot, sterile bottles. Silver or stoneware pipes are used throughout. The pressing, sterilizing, and filling rooms are all closed, and only the necessary operators are allowed in them. Orders are transmitted by telephone or through screen doors.

The color of the product is excellent and the flavor only barely distinguishable from fresh juice. It is superior to fresh juice made and allowed to stand for several hours.

The pulpy residue from which the juice is pressed is finely ground, mixed with sugar, and cooked to form "orange butter"—a spread not so sweet and less bitter than orange marmalade, but of a sub-acid and appetizingly aromatic flavor. On account of the very mild heating involved in the preparation of both juice and butter, the vitamin values are said to be unimpaired.

Anti-Sweet Ads Dropped By "Luckys"

A PROMISE that advertisements ascribing to cigarettes the power of maintaining a slender figure are definitely abandoned has been made to the Federal Trade Commission by an unnamed but easily recognizable tobacco company. The announcement of the Commission on Jan. 23 also contained the information that no paid testimonials will be used in the advertising of the company unless explanation is made that they were purchased.

The case of a musical comedy star who stated in a paid testimonial that the cigarettes kept him in good shape, with voice as clear as a bell, but who, in reality, never saw the statement prior to its use, was cited by the Commission as an example of alleged unfair methods of competition. Other phrases, such as "Women retain their slender figure" and "overweight is banished," also were condemned. It has been agreed that further advertisements of this type may be used as evidence in the trial of the complaint which the Commission may issue, should the practice be resumed.

The present series of advertisements of the company contain no mention of sweets as such. While they urge moderation, and suggest that overeating causing fat should be replaced by smoking, they also contain the eminently sage counsel that "even in smoking" one should be moderate. No testimonials are being used.

"Food Distribution" Makes Its Debut

Food Distribution, a new monthly magazine which will cover the distributing function in all the food trades, made its first appearance with the February, 1930, issue. Published by the Food Trades Publishing Company, Chicago, Ill., the paper is modern in typography and make-up as well as in editorial content. Numerous illustrations, which gain because of the high quality paper used, add to its attractiveness. The magazine will be of particular interest to the jobber, wholesaler, and retailer who desire to keep in touch with modern trends in the distribution of foods from producer to consumer.

COMING EVENTS

FEBRUARY

3-6—American Honey Institute, Milwaukee, Wis.
11—Dairy and Ice Cream Machinery and Supplies Association, New York City.
23—Potomac States Bakers' Association, Baltimore, Md.
27-March 1—Canners' League of California, Del Monte, Calif.

MARCH

17-20—American Society of Bakery Engineers, Chicago, Ill.

APRIL

7-11—American Chemical Society, Atlanta, Ga.
—American Dry Milk Institute.

MAY

5-9—American Association of Cereal Chemists, Chicago, Ill.
14—American Spice Trade Association, New York City.

Some Irradiated Foods Have Little Value, Says Expert

TEMPERING his consideration of the remarkable place that vitamin D and irradiation occupy in modern medical and dietetic science with a warning against expecting too much of them, Dr. Alfred F. Hess, of the University and Bellevue Hospital Medical College (N.Y.U.), told the latest developments in this field to the North Jersey Section of the American Chemical Society at the meeting in Newark, N. J., on Jan. 13.

He traced the work on this subject from the days when the connection between ultra-violet light and rickets was first established to the development of irradiated ergosterol, 1 gram of which, in its anti-rachitic properties, is equivalent to 6 tons of cod liver oil. At the present time, he said, the danger of giving too large a dose is as real as the danger of giving too little. Luckily, the range between a safe dose and an overdose is large.

The chief place of irradiated foods, and, in fact, the only place where it is specifically valuable, lies in the prevention or treatment of rickets in childhood and kindred diseases in adults and in animals. Their use as a general "health" food, as a tonic or to treat colds and tuberculosis, is open to question, Dr. Hess pointed out. Irradiated dried milk and, to a lesser extent, irradiated fluid milk, is certainly of value in the prevention and cure of rickets, he said. The difficulty lies in maintaining the potency of the preparation at a definite standard. Irradiated cereal is of considerably less value, both because the small amount of sterols in grain products make the potency slight and because the greatest need for vitamin D, to prevent rickets in childhood, comes when the child is not yet old enough to eat sufficient cereal, if, in fact, it is able to eat any. For normal adolescents and adults, he said, the vitamin D content of ordinary dairy products consumed in the diet probably is all that is necessary.

Dr. Hess also stressed the fact that standardized dosage by irradiated ergosterol, perhaps in the form of fortified cod liver oil can be easily regulated. Dosage by irradiated foods, however, is decided by the caloric value, rather than the anti-rachitic value, of the food.

In the discussion following the address, Dr. David Wesson told of the manufacture of irradiated margarin, a product which simulates the natural vitamin D content of butter.

Old Sugar Rates Retained by Senate; Bounty Plan Loses

By Paul Wooton
Washington Correspondent

THE SUGAR FIGHT appears to be over. Despite the muddle in which the whole tariff situation still remains, the consensus of opinion seems to be that the gulf of 64 cents per 100 pounds between the rate on Cuban sugar passed by the House and the present rate, which the Senate has voted to retain, will be closed by a lowering of the House rates —if, of course, a new tariff law is enacted at this time.

On Jan. 16, just about a year since hearings on sugar before the joint committee of both branches of Congress began, the Senate finally adopted the Harrison amendment retaining the present tariff rates of 2.20 cents a pound full duty and 1.76 cents on Cuban sugar. The vote was 48 to 38, considerably more decisive than was expected by many observers. Duties of $2 a ton on sugar cane, 40 per cent *ad valorem* on sugar candy, and about one-sixth of a cent a gallon on blackstrap molasses were also approved. On edible molasses the Senate has applied 0.3 cent per gallon plus 0.33 cent for each per cent of sugar above 48 per cent, a slight increase over the existing law.

The bounty plan, in spite of the leadership of Senator Borah, was also forcibly extinguished when the Senate rejected by a vote of 54 to 22, Senator Howell's plan of awarding 0.44 cent a pound to producers of domestic sugar.

Action on fats and oils is yet to come. A continued move to assess coconut oil and other vegetable products on the ground of interchangeability with domestic oils and fats is to be expected, but the current trend of Senate decisions makes any important upward revisions far from likely. That hides and leather were put back on the free list is a strong indication of a return to conservative policies.

About the only raise foreseen might be an additive differential on wheat, over the general 42 cents per bushel, for high protein content. Restoration of the 20 per cent preferential privilege for the exporting of flour to Cuba by millers using foreign wheat imported under bond is not to be expected.

IF SWIFT and Armour are to obtain modification of the 1920 consent decree, they must establish their case in court. This is the position taken by the Department of Justice, and the question now is whether the packers will carry on their fight for permission to handle groceries and engage in the retail distribution of meat. It is evident from the answer filed by the Department of Justice on Jan. 17 that the department will not recognize any merit in their plea that does not rest upon strictly legal grounds. The packers are challenged to produce strict proof of their claim that the conditions which led up to entry of the injunctive decree in 1920 no longer obtain. The department professes that it is "without knowledge of the same" and alleges that the packers' petitions do not state facts sufficient in law or equity to entitle them to any relief.

In conjunction with the petitions for modification, the Department of Justice had before it the testimony of farm organizations taken in an *ex parte* hearing staged last spring by the Department of Agriculture, in which there was practical unanimity of opinion that the packers should be permitted to own and operate stockyards and retail meat markets and to engage in the distribution of other food products.

The following statement was issued by the Department of Justice concerning the answer filed to the packers' petitions in the Supreme Court of the District of Columbia:

"The department has made a careful preliminary investigation into the facts involved in the application, but the questions presented are of grave importance as affecting the public interest and the matter must be dealt with by the courts."

AN AMENDMENT to the pure food and drug act designed to prevent the slack-filling of packages has been acted on favorably by the House Committee on Agriculture. The bill is sponsored by Chairman Haugen of the committee. With the indorsement of the committee and the Secretary of Agriculture, it is not believed that the measure will encounter any serious opposition.

Under the terms of the bill it is deemed a violation of the food and drug act if food sold in the package form does not completely fill the container, irrespective of whether or not the quantity of the contents is plainly marked on the outside of the package in terms of weight, measure or numerical count. It is specified, however, that in construing and applying this provision, reasonable variations shall be permitted and due allowance shall be made for the subsequent shrinkage or expansion of the food which results from natural or other causes beyond control.

In commenting upon the slack-filled-package bill, the Secretary of Agriculture has pointed out that such an amendment to the food and drugs act is very much to be desired. The bill was originally drawn to correct prevalence of slack-filling during the demoralized trade conditions incident to the War, the Secretary stated in a letter to Mr. Haugen. While not believing that the practice of slack filling is as extensive at the present time, the Secretary pointed out that the Department of Agriculture is continually encountering instances of deceptively filled packages which cannot be reached under the present terms of the law.

Downward Trend Continues

December witnessed the lowest rate of activity in the food products industry since May, 1928. It now appears that the high point of activity in the food products industry during 1929 was reached in September, since which time the rate of activity has decreased month by month. Past history indicates, however, that a drop in operation is to be expected at this season of the year. The December activity was 12.4 per cent under November and 3.1 per cent under December, 1928. The average volume of operations in the textile industry for 1929 as a whole, however, was 5.7 per cent over that witnessed during 1928, and the year far exceeds any previous year in the history of the industry in average rate of operations.

The current comparatively low rate of activity in the food products industry is but a reflection of the abnormally low operations of general industry at this time. Competent authorities place the December volume of general business—production and distribution —at about 8 per cent above normal operations during September. The current business and industrial adjustment probably will not run its full course much before the close of the spring months. It is expected, however, that by the middle of the year the process of readjustment will have been completed and the stage set for sustained and substantial recovery, which should result in a rather prompt restoration of normal conditions.

Coffee Prices Lowest In Twenty Years

THE first month of 1930 saw coffee prices drop to the lowest values in 20 years, as a result of the collapse of the Brazilian stabilization plan and the consequent dumping of great quantities of coffee on the market. Reductions in the retail price by chain stores and other large distributors have kept pace with the drop, an average reduction of 10 cents a pound within 6 weeks being reported by one large organization.

The recent riots in Haiti were caused by this economic condition, rather than anything political, according to Captain John H. Craige of the U. S. Marine Corps. "Three-fourths of Haiti's revenue comes from coffee, and this fall meant that the revenue of the nation was cut by almost 50 per cent at one stroke," he said.

Chicago Draws Great Convention Group; "Truth in Labeling," Canners' Theme

AMID the diversity of interest and the wide range of subjects covered at the group of conventions and their subdivisions held in Chicago from Jan. 20 to 25, the emphasis on truth in labeling seemed a worthy connecting link. At a joint session of the National Canners' Association and the National Wholesale Grocers' Association, on Jan. 20, truth in labeling, as well as its corollary, truth in advertising, was ably discussed.

The National Canners' Association is making active efforts to bring about an improvement in the status of canned food labels, to the end that the consumer may purchase intelligently and without deception, foodstuffs of the particular quality and character desired. Great interest was shown in the address by Paul B. Dunbar, of the U. S. Food, Drug, and Insecticide Administration, who made an emphatic attack on health claims for foods. Such claims tend to bring the food so designated into the patent-medicine class, he pointed out, and many of them, founded on half-truths and pseudo-scientific evidence, are dishonest and fraudulent.

Dr. Morris Fishbein, editor of the *Journal of the American Medical Association,* also spoke against fraudulent and unwarranted health claims for foods, emphasizing the need for the food manufacturer to carry out the necessary research before attempting to market his foods. As a means of protecting the public from fallacious claims for health-imparting foods the medical association, through its Council on Pharmacy and Chemistry, recently established a committee on foods. Only where health claims are substantiated by scientific tests will the committee on foods permit its findings to be published.

In discussing what advertising can do for the homemaker-consumer, Miss Lita Bane, associate editor of the *Ladies' Home Journal,* also stressed the evil of creating a false impression regarding the healthfulness of a food. A campaign for more informative labeling and to encourage consumers to read the labels was shown to be a real need.

Dr. Walter H. Eddy, of Teachers College, Columbia University, emphasized the fact that truths only partially told are as misleading to the consumer as unwarranted claims.

A DECIDED innovation at the convention that bids fair to have a permanent effect upon future programs were the informal conferences on canning problems and on raw products problems, held every afternoon. The idea of holding these conferences apart from the regular general and sectional programs is credited to Frank E. Gorrell, secretary of the association. It was planned to permit a small group that was deeply interested in the purely technological aspects of canning and crop production to meet informally and discuss their individual problems, no records being kept of the discussions. The original plan contemplated two small groups, but the interest became so widespread that these meetings assumed large proportions and had to be moved to large halls.

The character of the discussions can be compared to those of the technical group in the baking field—the Society of Bakery Engineers—or the newly organized Society of Dairy Engineers in the dairy field. No step has been taken to create a similar organization in the canning group, and it is probable that these meetings will continue to maintain their present informal status. Their significance, however, lies in the widespread interest in the purely production phases of canning. The problems of distribution have not pre-empted the entire interest of canners.

EVERY morning the ten commodity section groups into which the National Canners' Association is divided held meetings relating to their particular interests. At the tomato section, attention was focused upon the tomato tariff and other problems, such as grading, that affect the purchase of these products.

Development in breeding cabbage as well as in fermenting and canning sauerkraut were discussed at the kraut section. Bean beetles and bean diseases came in for a great deal of attention in the green bean section. Condemnation of quoting future prices too early was made by E. A. Miller, Biglerville, Pa., at the fruit-section meeting. "If future prices continue to be named early," he said, "it will be because we canners want to gamble and not because buyers gently name them."

Speaking of apple packing, Mr. Miller also urged the adoption of labels giving the actual contents of drained fruit, rather than the deceptive label giving the weight of total contents.

At the pea section, E. J. Cameron discussed the control of blancher contamination. It was found on investigation that blancher infection is frequent and widespread; in Wisconsin 65 per cent of the canneries visited showed some degree of blancher infection with bacterial types associated with spoilage. Chlorine and other chemicals have not proved satisfactory, and alkaline detergents do not destroy the spores of spoilage bacteria to a great extent. As most of the troublesome bacteria are thermophiles, he suggested that the blanchers be emptied and cooled with fresh cold water each night. In the morning they should be thoroughly flushed. Mr. Cameron also mentioned the use of gentian violet, a non-poisonous dye which, in concentrations of 1 to 1,000,000 parts water, will prevent the development of flat sour bacteria.

The futility of establishing a specific trade name for "whole kernel" canned corn until some means be provided for maintaining quality was brought out by Charles Meister at the meeting of the corn section.

C. E. Hume, of the G. W. Hume Company, San Francisco, was elected president of the association, succeeding E. B. Cosgrove, of La Sueur, Minn. Vice-presidents for 1930 will be F. A. Harding, of William Underwood Company, Watertown, Mass., and Leonard E. Wood, of the California Packing Corporation, San Francisco.

THE two-day program of the National Preservers' Association was in the nature of an informal mid-year meeting. Fruit-purchase information was the topic of greatest importance. Distribution and trade-practice problems also came in for much attention. A discussion on cold pack fruit, with special relation to high mold counts that have recently been decidedly troublesome, also took place.

Plans for the celebration of "National Sirup Week," a week in which every effort will be made to bring to the attention of the consumer, retailer and jobber the important place sirup and molasses occupy, were made at the meeting of the National Syrup and Molasses Association.

The ever-present problem of the chain store versus the independent store was the center for much of the discussion at the National Wholesale Grocers' Association. Container simplification, improved methods of distribution and modern warehouse methods also were important topics.

Trade practices in the mayonnaise industry were treated at a meeting of the trade practice committee of the Mayonnaise Products Manufacturers' Association on Jan. 20. The board of directors also met during the week.

Interest of all the groups was centered for considerable time on the great machinery and supply exhibit held at the Hotel Stevens.

The Largest Ever

Representatives of 10 national associations to whom problems of food preservation are vital took part in the great gathering at Chicago from Jan. 20 to 24. They form an imposing list: National Canners' Association, National Preservers' Association, Mayonnaise Products Manufacturers' Association (board of directors and trade practice committee), National Pickle Packers' Association, National Syrup & Molasses Association, National Kraut Packers' Association, National Food Brokers' Association, National Wholesale Grocers' Association, National Retail Grocers Secretaries' Association, and the exhibit and meeting of the Canning Machinery & Supplies Association.

Bacteria in Milk Is Lively Topic at Convention

AROUND the subject of thermophilic, or heat-loving, bacteria in milk was centered some of the most significant discussion that took place at the meeting of the agricultural and industrial bacteriology division of the Society of American Bacteriologists, part of the annual convention of the organization, held at Iowa State College, at Ames, Dec. 30 to Jan. 1.

That these bacteria, which continue to grow at temperatures lethal to all other forms of life, are probably not to be found within the udder of a normal cow, but are introduced into the milk after milking, was stated by P. Arne Hansen, of the New York State Agricultural Experiment Station, at Geneva.

M. W. Yale, formerly of the New York State Agricultural Experiment Station, showed that the development of thermophiles in milk was favored by the following factors: (1) The presence of thermophiles in raw milk supply; (2) re-pasteurization of returns from milk routes; (3) prolonged holding at pasteurizing temperatures; (4) the cooking of milk solids on the walls of internal-tube heaters and regenerative heater-coolers; (5) dead ends in pasteurizing equipment; (6) filter cloths; (7) development of thermophiles within the pasteurizer itself.

The paper that elicited most discussion was that by C. S. Mudge and M. L. Thorwaldson, of the California College of Agriculture, Davis, Calif., who offered a new concept of thermophilic bacteria, suggesting that thermophilic spores pass through a dormant stage in which they are killed only with difficulty, but that at another stage of development they are killed more easily.

To those who are interested in this theory, it is suggested that the article by F. M. Scales on combating "rope" in dairies (FOOD INDUSTRIES, Vol. I, page 622, 1929) be reread. By making use of the idea of "youth" in bacteria, Dr. Scales was able to kill them easily at the proper stage. The Mudge-Thorwaldson hypothesis, a much more complex theory than the "youth" concept evolved by James M. Sherman, which was the basis of Scales' work, also was discussed.

Swiss-cheese bacteriology was the subject of two papers by Burkey, Frazier, Matheson, and Watson—all from the staff of U. S. Bureau of Dairy Industry. The old problem of successful manufacture of swiss cheese with proper eye formation appears to be much nearer solution through the use of the right kind of bacteria.

The surface taint or surface flavor of butter was discussed by H. A. Derby, of Iowa State College. He finds a different cause for its development than that reported by D. B. Shutt (FOOD INDUSTRIES, Vol. 1, page 407, 1929). The indications are that several causes may result in surface taint of butter.

Sauerkraut fermentation was the subject of a paper by C. H. Keipper and E. B. Fred, of the University of Wisconsin. They showed that the better bacteria causing the fermentation of sauerkraut are present normaliy in the interior of the heads of cabbages. Washing the cabbage heads to reduce the proportion of the other types found on the outside of the heads resulted in an improved quality of kraut in a 26-barrel test.

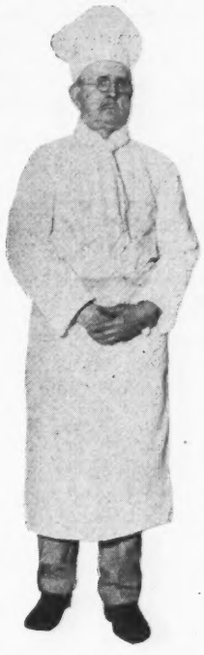
Pin-spot molding of shell eggs in cold storage was discussed by L. H. James and T. L. Swenson, of the U. S. Bureau of Chemistry and Soils. This form of spotting has not yet been solved, nor is it confined to any one locality.

"Cherry Blossoms" Wilted By Trade Commission

"CHERRY BLOSSOMS" or "cherry" is not to be used as an unqualified name for a beverage or concentrate not composed of the fruit, juice, or blossoms of the tree George Washington wouldn't lie about, according to the Federal Trade Commission.

An order issued recently compels the Cherry Blossom Manufacturing Company to cease marketing such a product unless the words "imitation" or "artificial color" appear in type equally as conspicuous. The Commission based its decision upon the fact that the former designations stifled competition and diverted trade from truthfully marked beverages.

Campbell's "Chef of Chefs" Honored by France



Louis Charles Delisle, head chef emeritus of the Campbell Soup Company, has recently been decorated by the French government with the Cross of *Chevalier du Mérite, agricole,* for the part he has played in spreading the popularity of French cooking through the medium of his company's soups.

M. Delisle entered the employ of the Campbell Soup Company 27 years ago. Previous to that he was employed for nine and one-half years by the Franco-American Food Company. In all of those thirty-six and a half years he was chef of chefs, specializing in the commercial production of soups.

Although he is now retired from active duty as head chef, M. Delisle is still a familiar figure in the Campbell kitchens.

Organization of the Food, Drug, and Insecticide Administration

W. G. Campbell, Director of Regulatory Work, in Charge.
P. B. Dunbar, Assistant Chief.
F. B. Linton, Assistant to the Chief.

WASHINGTON OFFICES

Interstate Supervision, C. W. Crawford.
Import Supervision, A. E. Taylor.
State and City Co-operation, W. S. Frisbie.
Food Control, ...
Microanalytical Laboratory, B. J. Howard.
Color Certification, H. T. Herrick.
Drug Control, J. J. Durrett.
Special Collaborative Investigations .....
Insecticide Control, C. C. McDonnell.
Naval Stores Control, F. P. Veitch.

FIELD SERVICE

EASTERN DISTRICT, 201 Varick Street, New York, N. Y.; W. R. M. Wharton, Chief.
Baltimore Station, 218 Water Street; D. M. Walsh, Chief.
Boston Station, United States Appraiser's Stores; G. H. Adams, Chief.
Buffalo Station, Federal Building; F. L. Wollard, Chief.
New York Station, 201 Varick Street; Joseph Callaway, Jr., Chief.
Philadelphia Station, 405 United States Appraiser's Stores; C. S. Brinton, Chief.
Rouses Point, N. Y., Station; H. B. Switzer, Chief.
San Juan, Porto Rico, Station, 301 Post Office Building; W. J. McGee, Chief.
Savannah Station, United States Customhouse; J. J. McManus, Chief.

CENTRAL DISTRICT, 1625 Transportation Building, Chicago, Ill.; J. O. Clarke, Chief.
Chicago Station, 1625 Transportation Building; H. D. Garrett, Chief.
Cincinnati Station, 411 Government Building; S. A. Postle, Chief.
Kansas City Station, 400 Post Office Building; W. H. Hartigan, Chief.
Minneapolis Station, 310 Federal Office Building; C. W. Harrison, Chief.
New Orleans Station, 225 United States Customhouse; E. C. Boudreaux, Acting Chief.
St. Louis Station, 204 Old Customhouse; E. R. Smith, chief.

WESTERN DISTRICT, United States Appraiser's Stores, San Francisco, Calif.; Wendell Vincent, Chief.
Denver Station, 518 Tabor Opera House Building: J. E. Kimbel, Chief.
Los Angeles Station, 609 Federal Building; B. C. Winslow, in charge.
San Francisco Station, 33 United States Appraiser's Stores; G. J. Morton, Chief.
Seattle Station, 400 Holyoke Building; A. W. Hansen, Chief.

Directory of State Officials Charged With Enforcing Foo

. . . Correct to Jan. 1, 1930

THIS DIRECTORY contains the officers to whom letters of inquiry may be addressed regarding the subjects under their respective jurisdiction. Where a subject is not mentioned, it indicates there is no existing statute. The list was compiled by W. S. Frisbie, chemist in charge of co-operation, U. S. Department of Agriculture, Food, Drug and Insecticide Administration, Washington, D. C.

FOOD, DRUGS, DAIRY PRODUCTS, AND FEEDING STUFFS
H. M. Robertson, Supervisor
Division of Agricultural Chemistry
Agriculture and Industries Department
Montgomery, Ala.

FOOD AND FEEDING STUFFS
Miss Jane H. Rider, Director
State Laboratory
University of Arizona
Tucson, Ariz.

DAIRY PRODUCTS
T. P. Morgan, State Dairy Commissioner
Phoenix, Ariz.

FOOD AND DRUGS
W. N. Wilkes, Commissioner
Department of Mines, Manufactures, and Agriculture
Little Rock, Ark.

FEEDING STUFFS
Parker C. Ewan, Commissioner
of Conservation and Inspection
Little Rock, Ark.

FOOD, DRUGS, AND FEEDING STUFFS
Prof. M. E. Jaffa, Chief
Bureau of Foods and Drugs
State Department of Public Health
Berkeley, Calif.

DAIRY PRODUCTS
Dr. M. E. McDonald, Chief
Bureau of Dairy Control
Department of Agriculture
Sacramento, Calif.

FOOD AND DRUGS
S. H. Loeb, Commissioner
Division of Pure Food and Drugs
State Board of Health
Denver, Colo.

DAIRY PRODUCTS
W. R. Freeman, State Dairy Commissioner
Fort Collins, Colo.

FEEDING STUFFS
John J. Tobin
Mixed Feed Division
Capitol Building
Denver, Colo.

FOOD, DRUGS, DAIRY PRODUCTS, AND FEEDING STUFFS
Thomas Holt, Dairy and Food Commissioner
Hartford, Conn.

FOOD AND DRUGS
Dr. Arthur C. Jost, Executive Officer
State Health and Welfare Commission
Dover, Del.

FEEDING STUFFS AND DAIRY PRODUCTS
Dr. H. H. Hanson, State Chemist
State Board of Agriculture
Dover, Del.

FOOD, DRUGS, AND DAIRY PRODUCTS
Dr. W. C. Fowler, Health Officer
Health Department
Washington, D. C.

FOOD, DRUGS, AND FEEDING STUFFS
Mr. Nathan Mayo, Secretary
Agricultural Department
Tallahassee, Fla.

FOOD, DRUGS, AND FEEDING STUFFS
Eugene Talmadge, Commissioner
Department of Agriculture
Atlanta, Ga.

FOOD, DRUGS, AND DAIRY PRODUCTS
C. K. Macey, Commissioner
Department of Public Welfare
Boise, Idaho

FOOD, DAIRY PRODUCTS AND FEEDING STUFFS
Perry B. McCullough, Superintendent
Division of Foods and Dairies
Department of Agriculture
228 S. Wabash Ave., Chicago, Ill.

FOOD, DRUGS, AND DAIRY PRODUCTS
I. L. Miller
State Food and Drug Commissioner
State Board of Health
Indianapolis, Ind.

FEEDING STUFFS
Prof. H. R. Kraybill, State Chemist
Agricultural Experiment Station
Purdue University
Lafayette, Ind.

FOOD, DAIRY PRODUCTS, AND FEEDING STUFFS
M. G. Thornburg, Secretary
State Department of Agriculture
Des Moines, Iowa

FOOD AND DRUGS
Dr. Earle G. Brown, Secretary
State Board of Health
Topeka, Kan.

FEEDING STUFFS AND DAIRY PRODUCTS
J. C. Mohler, Secretary
State Board of Agriculture
State House
Topeka, Kan.

FOOD AND DRUGS
Mrs. F. C. Dugan, Director
Bureau of Foods, Drugs, and Hotels
State Board of Health
Louisville, Ky.

FEEDING STUFFS
J. D. Turner
Head of Department of Feeding Stuffs
Agricultural Experiment Station
Lexington, Ky.

FOOD, DRUGS, AND DAIRY PRODUCTS
Dr. Jas. A. O'Hara, President
State Board of Health
New Court Building
New Orleans, La.

FEEDING STUFFS
Harry D. Wilson, Commissioner
Department of Agriculture and Immigration
Baton Rouge, La.

FOOD, DRUGS, DAIRY PRODUCTS, AND FEEDING STUFFS
A. M. G. Soule, Chief
Division of Inspection
Department of Agriculture
Augusta, Me.

FOOD, DRUGS, AND DAIRY PRODUCTS
A. L. Sullivan
State Food and Drug Commissioner
Department of Health
Baltimore, Md.

FEEDING STUFFS
L. E. Bopst, Assistant State Chemist
Inspection and Regulatory Service
University of Maryland
College Park, Md.

FOOD, DRUGS, AND DAIRY PRODUCTS
Hermann C. Lythgoe, Director
Division of Food and Drugs
Department of Public Health
Boston, Mass.

FEEDING STUFFS
Philip H. Smith, Official Chemist
Feed Control
Agricultural Experiment Station
Amherst, Mass.

FOOD AND FEEDING STUFFS
Peter D. Dukesherer, Director
Bureau of Foods and Standards,
Department of Agriculture
Lansing, Mich.

DRUGS
G. M. Benedict
Director of Drugs and Drug Stores
Michigan Board of Pharmacy
Lansing, Mich.

DAIRY PRODUCTS
T. H. Broughton, Director
Bureau of Dairying
Department of Agriculture
Lansing, Mich.

FOOD AND DAIRY PRODUCTS
A. D. Sibbald, Assistant Commissioner
State Dairy and Food Commission
St. Paul, Minn.

DRUGS
J. W. Dargavel, Secretary
State Board of Pharmacy
2943 27th Ave. S., Minneapolis, Minn.

FEEDING STUFFS
H. A. Halvorson, Chemist in Charge
Division of Feed Inspection
Dairy and Food Commission
St. Paul, Minn.

FOOD
Dr. W. F. Hand, State Chemist
A. & M. College, Miss.

DAIRY PRODUCTS AND FEEDING STUFFS
J. C. Holton, Commissioner
Department of Agriculture and Commerce
Jackson, Miss.

FOOD AND DRUGS
C. H. Manville, Commissioner
Food and Drug Department
Jefferson City, Mo.

FEEDING STUFFS
Jewell Mayes, Secretary
Board of Agriculture
Jefferson City, Mo.

Food, Drug, Dairy Product, and Feeding-Stuff Laws

FOOD AND DRUGS
Glenn D. Wiles, Director
Division of Food and Drugs,
Department of Public Health
Helena, Mont.

DAIRY PRODUCTS
B. F. Thrailkill, Chief
Division of Dairying
Department of Agriculture, Labor
and Industries, Helena, Mont.

FOOD, DRUGS, DAIRY PRODUCTS AND FEEDING STUFFS
O. V. McCracken, Chief
Bureau Foods, Drugs, and Oils
Department of Agriculture
Lincoln, Neb.

FOOD, DRUGS, AND DAIRY PRODUCTS
S. C. Dinsmore
Food and Drug Commissioner
Public Service Department
University of Nevada, Reno, Nev.

FOOD, DRUGS, AND DAIRY PRODUCTS
Dr. Charles D. Howard, Chief
Division of Chemistry and Sanitation
State Board of Health
Concord, N. H.

FEEDING STUFFS
Andrew L. Felker, Secretary
Department of Agriculture
Concord, N. H.

FOOD, DRUGS, AND DAIRY PRODUCTS
W. W. Scofield, Chief
Bureau of Food and Drugs
Department of Health
Trenton, N. J.

FEEDING STUFFS
Dr. Chas. S. Cathcart, State Chemist
Agricultural Experiment Station
New Brunswick, N. J.

FOOD (*Sanitary Law only*)
Dr. Geo. S. Luckett, Director
Department of Public Welfare
Santa Fe, N. M.

DAIRY PRODUCTS
J. R. Poe, State Dairy Commissioner
State College, N. M.

FOOD, DAIRY PRODUCTS, AND FEEDING STUFFS
Kenneth F. Fee, Director
Dairy and Food Bureau
Department of Agriculture and Markets
Albany, N. Y.

DRUGS
Geo. W. Mather, Secretary
State Board of Pharmacy
Education Building, Albany, N. Y.

FOOD AND DRUGS
Dr. W. M. Allen,
State Food and Oil Chemist
Department of Agriculture
Raleigh, N. C.

FEEDING STUFFS
L. M. Nixon,
Chemist in Charge of Feed Control
Department of Agriculture
Raleigh, N. C.

FOOD, DRUGS, AND FEEDING STUFFS
R. O. Baird,
State Food Commissioner and Chemist
Bank of North Dakota Building
Bismarck, N. D.

DAIRY PRODUCTS
E. A. Greenwood, Dairy Commissioner
Department of Agriculture and Labor
Bismarck, N. D.

FOOD, DRUGS, AND DAIRY PRODUCTS
O. J. Bailey, Chief
Dairy and Food Division
Department of Agriculture
Columbus, Ohio

FEEDING STUFFS
D. M. Odaffer, Chief
Division of Feeds and Fertilizers
Department of Agriculture
Columbus, Ohio

FOOD AND DRUGS
P. J. Folan, Asst. Commissioner
Department of Public Health
Oklahoma City, Okla.

FEEDING STUFFS
A'Noble Ladd, Chief Inspector
Feed and Fertilizer Inspection Department
State Board of Agriculture
Oklahoma City, Okla.

DAIRY PRODUCTS
A. F. Howe, Dairy Commissioner
Dairy Department
State Board of Agriculture
Oklahoma City, Okla.

FOOD, DAIRY PRODUCTS, AND FEEDING STUFFS
J. D. Mickle, Commissioner
Dairy and Food Commission
508 Worcester Building
Portland, Ore.

FOOD, DAIRY PRODUCTS, AND FEEDING STUFFS
Dr. James W. Kellogg, Director
Bureau of Foods and Chemistry
Department of Agriculture
Harrisburg, Pa.

DRUGS
Chas. F. Kramer, Secretary
State Board of Pharmacy
Harrisburg, Pa.

FOOD, DRUGS, AND DAIRY PRODUCTS
Michael H. Corrigan, Chairman
Board of Food and Drug Commissioners
State House
Providence, R. I.

FEEDING STUFFS
John B. Smith, Chemist
Agricultural Experiment Station
Kingston, R. I.

FOOD, DRUGS, AND FEEDING STUFFS
J. W. Shealy, Commissioner
Department of Agriculture, Commerce
and Industries
Columbia, S. C.

FOOD, DRUGS, DAIRY PRODUCTS, AND FEEDING STUFFS
T. O. Ronayne, Director
Division of Inspection
Department of Agriculture
Pierre, S. D.

FOOD, DRUGS, DAIRY PRODUCTS, AND FEEDING STUFFS
..... Superintendent
Division of Foods, Fertilizers, and Dairies
State Department of Agriculture
Nashville, Tenn.

FOODS, DRUGS, AND DAIRY PRODUCTS
E. G. LeMay, Director
Food and Drug Bureau
State Board of Health, Austin, Texas

FEEDING STUFFS
F. D. Fuller, Chief
Feed Control Service
Agricultural Experiment Station
College Station, Texas

FOOD, DRUGS, DAIRY PRODUCTS, AND FEEDING STUFFS
Edward Southwick, Chief
Dairy and Food Division
State Board of Agriculture
Salt Lake City, Utah

FOOD, DRUGS, AND DAIRY PRODUCTS
Dr. C. F. Dalton, Secretary
State Board of Health, Burlington, Vt.

FEEDING STUFFS
L. S. Walker, Regulatory Chemist
University of Vermont
Burlington, Vt.

FOOD, DAIRY PRODUCTS, AND FEEDING STUFFS
F. C. Breazeal, Director
Dairy and Food Division
Department of Agriculture and Immigration
Richmond, Va.

DRUGS
Dr. A. L. I. Winne, Secretary
State Board of Pharmacy
712 State Office Building, Richmond, Va.

FOOD, DRUGS, AND FEEDING STUFFS
Ira H. Case, Supervisor
Division of Foods, Feed, and Drugs
Department of Agriculture, Olympia, Wash.

FOODS, DRUGS, AND DAIRY PRODUCTS
Dr. W. T. Henshaw, Commissioner
State Department of Health
Charleston, W. Va.

FEEDING STUFFS
John W. Smith, Commissioner
Department of Agriculture
Charleston, W. Va.

FOODS, DRUGS, AND DAIRY PRODUCTS
C. L. Hill, Commissioner,
Department Agriculture and Markets
Madison, Wis.

FEEDING STUFFS
W. B. Griem, Director
Feed and Fertilizer, Inspection Division
Department of Agriculture
Madison, Wis.

FOOD, DRUGS, DAIRY PRODUCTS, AND FEEDING STUFFS
Arling Gardner, Chief Deputy
Dairy, Food, and Oil Division
Department of Agriculture
Cheyenne, Wyo.

Narrow Tolerances Void Bread Law

THE standard bread-loaf law of Nebraska, which attempted to fix within narrow limits the weight of bread loaves and the maximum amount of shrinkage, has been declared unconstitutional by the Nebraska District Court of the United States. This is the second state law to be voided by the courts, a similar but even more stringent set of tolerances having been declared unconstitutional in 1921.

The present law was passed in 1927, but had been suspended since that time by order of the courts. Attempts of the Nebraska officials backed by the state Secretary of Agriculture, to enforce the statute led to its being declared unconstitutional. The law allowed a tolerance of an ounce per pound, and provided that the required weight should be existent 12 hours after delivery to the retailer. Thirteen baking firms joined in attacking the law, and the federal court upheld their contention that they should not be penalized for shrinkage 12 hours after delivery to the retailer, which might be due to store conditions over which the baker had no control.

TRADE NOTES

ARCTIC ICE CREAM COMPANY and HOME ICE CREAM COMPANY, St. Louis, Mo., have been purchased by a group headed by S. H. Berch, president of Western Dairy Products, Inc., and of California Dairies, Inc., Los Angeles, Calif. About $1,000,000 was involved in the purchase.

BORDEN COMPANY, New York City, continued to expand during January. Announcement was made on Jan. 8 that Mitchell Dairy Company, Bridgeport, Conn., and Hall Ice Cream Company, Glens Falls, N. Y., would be acquired in an application to list 122,016 more shares of stock. On Jan. 22, approval was given for the issuance of 26,033 additional shares for the absorption of the Willow Brook Dairy, Mount Vernon, N. Y.; Boulevard Dairy Company, Albany, N. Y.; Collar City Creamery Company, Inc., Troy, N. Y.; and Certified Ice Cream Company, Chicago, Ill.

CANADA DRY GINGER ALE, INC., has entered preliminary negotiations looking to a merger with White Rock Mineral Springs Company, P. D. Saylor, president of the former organization, admitted recently. Canada Dry's sales volume is more than $12,500,000 annually and White Rock's is about $3,300,000. The new company would be second only to Coca-Cola in the soft-drink field.

CONSOLIDATED PRODUCE COMPANY, LTD., Los Angeles, Calif., was recently formed by the merger of Rivers Brothers Company, Inc., Klein-Simpson Fruit Company, and Meyers-Darling & Hinton Company, three of the largest and oldest wholesale commission houses in Southern California.

FRUIT INDUSTRIES, INC., San Francisco, Calif., a $30,000,000 company formed by a number of manufacturers of grape products, recently received a state corporation permit. The merger includes the following companies: California Grape Products Company, California Wine Association, Colonial Grape Products Company, Community Grape Corporation, Garrett & Company, Italian Vineyard Company, National Fruit Products Company, and the portion of the Earl Fruit Company dealing in grape byproducts.

GENERAL FOODS CORPORATION has withdrawn the plan of awarding discounts for sales increases of its products by stores. The company hopes to find another plan which will give effect to its "fundamental principle of rewarding those who by their efforts contribute to the company's progress," without causing the dissatisfaction which the abandoned plan occasioned.

GOLD DUST CORPORATION, New York City, is moving its executive and subsidiary offices to the new American Book Building, 80-88 Lexington Avenue. It has leased the first 4 floors.

LIBBY, MCNEILL & LIBBY have purchased the Lake Mills Canning Company at Elkhorn, Wis., for a reported price of $2,500,000. Present executives are being retained.

NATIONAL BISCUIT COMPANY will increase its capital stock $60,000,000 and make a 2½ for 1 split-up of common stock and other changes, if a plan recently approved by the directors is voted favorably by the stockholders. Present capitalization is $85,000,000.

WESTON BISCUIT COMPANY, Toronto, Ont., will have a greatly increased output after about Feb. 1, when its new plant at Passaic, N. J., is opened. The company is planning to establish several other plants in the western part of the country.

YUBAN COFFEE, INC., has been organized to take over the Yuban Coffee division of Arbuckle Brothers. It is understood that the new corporation will become one of the divisions of Grocery Store Products, Inc.

PERSONALS

C. H. BAILEY, in addition to his duties as professor of biochemistry at the University of Minnesota, is now connected with General Mills as technical director of their extensive research program.

DONALD K. DAVID, formerly vice-president of Standard Brands, Inc., has resigned this office, but will continue as a member of the board of directors. Mr. David has been elected chairman of the executive committee of the American Maize-Products Company.

JOSEPH S. DAVIS, of California, has been appointed chief economist for the Federal Farm Board. Since 1921, Mr. Davis has been a director of the Food Research Institute at Leland Stanford University, specializing on wheat studies and the general agricultural situation. He has made economic studies of international importance for the Dawes Reparations Committee and the International Committee of Bankers on Mexico.

C. M. FRAENKEL, plant manager of the coconut-oil mill and refinery of the Durkee Famous Foods, Inc., Berkeley, Calif., a subsidiary of the Glidden Company, has resigned. He has been succeeded by PAUL X. SMITH, formerly office manager.

JOHN HADDEN, production manager of the New York City factory of the National Biscuit Company, has been made assistant to the president of that organization.

GEORGE HINTZ, of Wesseks, Kulenkampff & Company, has been elected president of the Cocoa Merchants' Association of America.

RAY M. HUDSON, formerly assistant director of the National Bureau of Standards in charge of commercial standardization, has resigned to become secretary of the Massachusetts division of the New England Council.

G. C. KINDERVATER was recently elected president of the Metropolitan Association of Ice Cream Manufacturers, New York City.

J. P. LEWIS, formerly of the Nebraska Consolidated Mills Company, Grand Island, Neb., is now with the Aberdeen Protein Testing Laboratory, Aberdeen, S. D. Mr. Lewis was succeeded by A. A. ANDRE, of Grand Island.

ELTON L. MARSHALL, of Chillicothe, Mo., has been sworn into office as solicitor for the Department of Agriculture, it was announced recently. He succeeds R. W. Williams, who is an ornithologist as well as a lawyer, and has obtained a transfer to the Biological Survey.

JOHN MEYERKORT has resigned as export manager of the White Rock Mineral Springs Company and will become general manager of the Henry Trading Company, sole distributor in the United States for Schweppe beverages.

F. K. MONTGOMERY has been elected a vice-president of the National Biscuit Company. He will be in charge of the sales department.

FREDERICK K. MORROW, president of the United Cigar Stores Company, has been appointed a director of the Ogilvie Flour Mills, Ltd., Montreal, Que., it was announced on Jan. 20.

HARRY A. MURRAY, JR., has been appointed chief chemist of the National

Biscuit Company. Dr. Murray succeeds GLENN M. DAVIDSON, who was recently transferred to the operating department.

E. S. MUNSON, vice-president of Air Reduction, Inc., has been elected a director of Canada Dry Ginger Ale, Inc.

NEILS I. NEILSEN has been appointed by the Bureau of Agricultural Economics, U. S. Department of Agriculture, as agricultural commissioner at Marseilles, France. Mr. Neilsen has been associated with the Bureau since 1922 as crop and livestock estimator with headquarters at Sacramento, Calif.

J. R. PETERS, of New York City, was recently elected first vice-president, member of the executive committee, and a director of the Weston Biscuit Corporation, Toronto, Ont.

RUDOLPH SPRECKELS, of Spreckels Sugar Corporation, New York City, was chosen president of the Sugar Institute, Inc., at the annual meeting on Jan. 17. He succeeds EARL D. BABST, who declined re-election but was elected honorary president. JAMES H. POST was elected chairman of the board of directors of the organization.

L. L. TAYLOR, manager of the Blue Ridge Products Company, Rutherfordton, N. C., was recently elected president of the North Carolina Ice Cream Manufacturers' Association.

D. K. TRESSLER, formerly engaged in research work with the Mellon Institute, has become a member of the research staff of General Foods Company.

ANDREW WELCH has resigned as chairman of the board of governors and of the board of directors of the California & Hawaiian Sugar Refining Corporation, San Francisco, Calif. GEORGE ROLPH has been named as an additional member to the board of governors.

CLARENCE WILSON recently joined the staff of the California Fruit Growers' Exchange research laboratory at its Corona, Calif., branch. Mr. Wilson came to his new position from the Hawaiian Islands, where he was chemist for several sugar plantations.

OBITUARY

JOHN R. CRUSE, of South Orange, N. J., Eastern sales manager at the New York office of the Armour Packing Company, died suddenly on Jan. 9 while returning home on a train.

ROBERT MAGILL, secretary of the Winnipeg Grain Exchange and international authority on grain marketing, died on Jan. 15 at the Battle Creek (Mich.) Sanitarium. Dr. Magill was 58 years of age. He was chairman of the Dominion of Canada Grain Board at the outbreak of the World War, and became chairman of the Board of Grain Supervisors, through which the government assumed control of wheat marketing at that time.

G. W. KENISON, president of the Jersey Ice Cream Company, Lawrence, Mass., which last year became a part of the National Dairy Products Corporation, died on Dec. 29, 1929, while on the Clyde liner "Mohawk" on the way to Jacksonville, Fla. Mr. Kenison, who was 48 years old, had long been prominent in the ice-cream industry. He was a former president of the New England Association of Ice Cream Manufacturers and a member of the board of directors of the International Association of Ice Cream Manufacturers.

HENRY E. NIESE, former general manager of the American Sugar Refining Company, died at his home in Jersey City, N. J., on Dec. 30, 1929, at the age of 81. Mr. Neise was president of the New York Sugar Trade Laboratory several times and was one of the founders of the American Chemical Society.

JOHN T. NORTON, for 8 years inspector of dairy products with the New York State Hospital Commission, died at his home in New York City on Jan. 17. Mr. Norton, who was also well known as an athlete and turf enthusiast, was 62 years old.

JOHN SEXTON, founder of John Sexton & Company, manufacturing wholesale grocery firm, Chicago, Ill., died at his home in Los Angeles on Jan. 15. Mr. Sexton was 71 years of age and, as chairman of the board of directors, was still interested in the company that bears his name. A few years ago he was succeeded as president by his son, Sherman J. Sexton.

New Construction

Abbatoir — Pennsylvania R.R. Co., Pennsylvania Station, New York, N. Y., awarded contract for the construction of a 2 story hog abbatoir at 5th and Henderson Sts., Jersey City, N. J., to Deakman Wells Co., 921 Bergen Ave., Jersey City. Estimated cost $40,000.

Bakery — W. Abdow, 32 Norfolk St., Worcester, Mass., is having plans prepared for the construction of a 1 story, 40 x 50 ft. addition to bakery on Norfolk St. Estimated cost $15,000. H. L. Meacham & Associates, 120 Front St., Worcester, are architects.

Bakery—Bd. of Affairs, Capitol, Oklahoma City, Okla., awarded contract for the construction of a new bakery for school for feeble minded near Enid, to E. C. Ross, 1128 West 12th St., Oklahoma City. Estimated cost $35,000.

Bakery — Campbell Baking Co., 121 West Washington Ave., Oklahoma City, Okla., has work under way on the construction of a 2 story, 140 x 172 ft. bakery. Estimated cost $250,000. W. T. Vahlberg, Braniff Bldg., Oklahoma City, is architect. E. V. McCright is general contractor.

Bakery—Dugan Bros., L. Finklestone, 945 Main St., Bridgeport, Conn., is having plans prepared for the construction of a bakery at Boston, Dean, Glenwood and Hawley Sts. Estimated cost $325,000. Fletcher-Thompson Inc., 542 Fairfield Ave., Bridgeport, are architects. Maturity in spring.

Bakery — A. Durivage, 5276 Fabre St., Montreal, Que., plans the construction of a 2 story, 40 x 45 ft. bakery.

Bakery—General Baking Co., 420 Lexington Ave., New York, N. Y., will receive bids about Mar. 1 for the construction of a bakery at Detroit, Mich. C. M. Comstock, 122 East 42nd St., New York, N. Y., is architect.

Bakery—Gordon Baking Co., Woodward St., Detroit, Mich., will build a bakery on Van Alst Ave. and South Jane St., Long Island City, N. Y. Estimated cost $50,000. Work will be done by separate contracts.

Bakery — Holsum Baking Co., 1701 South Calhoun St., Fort Wayne, Ind., awarded contract for the construction of a factory to M. Irmscher & Sons, 1113 First National Bank Bldg., Fort Wayne. Estimated cost $41,000.

Bakery — Ideal Baking Co., 1518 Wabash Ave., Terre Haute, Ind., is having plans prepared for the construction of a bakery. Estimated cost $40,000. Private plans.

Bakery Plant—Model Grocery Co., Pasadena, Calif., is having plans prepared for the construction of a 3 story baking plant, warehouse and distribution plant at Oak Knoll Ave. Estimated cost $400,000. Foss Co., 171 South Las Robles Ave., Pasadena, is architect.

Bakery—C. J. Patterson Corp., H. Herff, 36 North Third St., Memphis, Tenn., awarded contract for a 1 story, 150 x 300 ft. bakery to Fogel Construction Co., 619 Reliance Bldg., Kansas City, Mo. Estimated cost $300,000.

Bakery—Quality Bakers, 469 5th Ave., New York, N. Y., awarded contract for a 2 story, 130 x 200 ft. bakery at Reading, Pa., to H. Burkhash, Reading, Pa. Estimated cost $150,000.

Bakery — Tietelbaum Baking Co., Parkside and East Rogers Aves., Brooklyn, N. Y., will soon award contract for the construction of a bakery. Estimated cost $40,000. E. J. Robin, 415 Lexington Ave., New York, is architect. D. Bunch, 347 Madison Ave., New York, is engineer.

Bakery Addition—La Lilly Corp., A. K. Strasser, Pres., 411 4th Ave., New York, N. Y., awarded contract for addition to bakery to H. L. Fischer Construction Co., 415 Lexington Ave., New York. Estimated cost $65,000.

Bakery Addition—L. E. Paige, 575 Rutherford Ave., Charlestown, Mass., awarded contract for addition and alterations to bakery on Rutherford Ave. to F. J. Gallagher, 580 Huron Ave., Cambridge.

Bottling Plant—Coca-Cola Bottling Co., Front St., Lake Charles, La., awarded contract for a 2 story, 71 x 115 ft. bottling plant at Lawrence and Bilbo Sts., to E. T. Buford, Lake Charles. Estimated cost $40,000; also plans a 2 story, 150 x 325 ft. plant at Beaumont, Tex., $50,000. Equipment will be required.

Bottling Plant—Charlotte Coca-Cola Bottling Co., 211 North Graham St., Charlotte, N. C., plans the construction of a 2 story, 110 x 186 ft. bottling plant including storage building, shops, etc. Estimated cost $100,000. M. R. Marsh, Builders Bldg., Charlotte, is architect.

Bottling Plant—Vidalia Coca Cola Bottling Co., Vidalia, Ga., awarded contract for a 1 story bottling plant to R. N. McEachern, Douglas, Ga. Estimated cost $50,000.

Bottling and Pasteurization Plant — Owner, c/o W. H. Toepke, 74 New Montgomery St., San Francisco, Calif., Archt., plans the construction of a 2 story bottling and pasteurization plant at Burlingame. Estimated cost $50,000.

Liquid Carbonic Factory — Liquid Carbonic Corp., 3100 South Kedzie Ave., Chicago, Ill., awarded contract for the construction of a factory on Hostetter St., Los Angeles, Calif., to The Austin Co. of California, 777 East Washington St., Los Angeles. Estimated cost $100,000.

Celery Plant—Manatee Celery Co., Sarasota, Fla., awarded contract for the construction of a plant, to T. A. Monk, Bradenton, also precooling plant, to Gay Engineering Co., Sarasota.

Canning Plant (Salmon) — Alaska Pacific Salmon Corp., Kake, Alaska, awarded contract for the construction of a 2 story, 60 x 256 ft. salmon canning plant, to The Austin Co., 16112 Euclid Ave., Cleveland, O. Estimated cost $50,000.

Cannery — Garden Valley Canning Co., L. Pecoraro, Pres., 458 North 7th St., San Jose, Calif., awarded contract for the construction of a 1 story cannery to F. Hoyt, 495 South 13th St., San Jose. Estimated cost $150,000.

Canning Factory—Midwest Canning Co., New Rochelle, Ill., awarded contract for the construction of a group of buildings including 1 story, 65 x 400 ft. warehouse, 3 story, 88 x 170 ft. factory, 3 story, 78 x 120 ft. retort building, 50 x 88 ft. pea factory, etc., at Sleepy Eye, Minn., to G. Schwartz & Son, Rochester, Minn. Estimated cost $400,000.

Canning Plant (Vegetable) — Griggs Canneries, New Albany, Ind., will build a bean and tomato canning plant at Natalia, Tex. Estimated cost $35,000. Private plans. Work will be done by owners forces. Equipment purchased.

Canning Plant Addition — Quality Canners Ltd., Harrow, Ont., plans addition to canning plant on Main St. Estimated cost $50,000. Private plans. Equipment for canning tomatoes will be required.

Cheese Factory—Kraft Phoenix Cheese Co., c/o E. P. Moore, Sylvan Rd. S. W., Atlanta, Ga., is having plans prepared for the construction of a cheese factory. Estimated cost $125,000. Private plans.

Creamery—Knudsen Creamery, Santa Maria, Calif., plans the construction of a creamery at Lompoc. Estimated cost $50,000. Architect not selected.

Creamery and Ice Cream Plant — McComb Creamery & Ice Cream Co., L. P. Herrin, Mgr., McComb, Miss., will build a 1 story, 55 x 105 ft. creamery and ice cream plant on South Blvd. Estimated cost $100,000. Work will be done by day labor.

Creamery and Ice Cream Plant — Wasco Creamery Co., Wasco, Calif., plans the construction of a 3 story creamery and ice cream plant at Union Ave. and 18th St., Bakersfield. Estimated cost $150,000. Architect not announced.

Creameries—Farmers Co-Operative Creamery Co., El Reno, Okla., is having preliminary plans prepared for the construction of a creamery at El Reno, also at Bristow, Okla. Estimated cost $25,000 each. Private plans.

Dairy Plant—Canham Dairies, Inc., 1128 Poplar St., Fresno, Calif., plans the construction of a dairy plant. Estimated cost to exceed $50,000.

Dairy Plant—Gold Medal Dairy Co., Evansville, Ind., is having plans prepared for the construction of a dairy plant at Division and South Garvin Sts. Estimated cost $44,000. Private plans.

Dairy Plant—F. J. Ricker, 685 Hudson Ave., West New York, N. J., Archt., will receive bids about Feb. 1 for the construction of a 75 x 118 ft. dairy plant at 565-67-69 30th St., North Bergen, for E. Hohneker, 563 30th St., North Bergen. Estimated cost $40,000.

Ice Cream Manufacturing Plant—Bryer Ice Cream Co., 347 Passaic Ave., Newark, N. J., awarded contract for the construction of a 4 story, 80 x 100 ft. addition to ice cream manufacturing plant at Newark, also 1 story addition to plant at Long Island City, N. Y., to Turner Construction Co., 420 Lexington Ave., New York, N. Y.

Ice Cream Factory—Good Humor Ice Cream Co., 7125 Santa Monica Blvd., Los Angeles, Calif., is having plans prepared for the construction of a 2 story, 60 x 119 ft. ice cream plant at Romaine St. and Sycamore Ave. Estimated cost $50,000. Hamm, Grant & Bruner Inc., 607 Ferguson Bldg., are architects.

Ice Cream Plant—Marioni Ice Cream Co., Barraclough Ave., Hamden, Conn., awarded contract for a 2 story, 45 x 60 ft. ice cream plant to Larkin-Carey Co., 166 Brewery St., New Haven. Estimated cost $40,000.

Ice Cream Factory—Whittier Ice Cream Co., Whittier, Calif., awarded contract for a 1 and 2 story, 65 x 83 ft. ice cream factory to Wheatland Construction Co., Whittier Blvd. Estimated cost $23,737.

Milk Plant—Armour & Co., c/o C. G. Calhoun, Fort Worth, Tex., plans the construction of a milk plant at Georgetown, Tex.

Milk Plant—Lamesa Milk Products Co., c/o S. L. Forrest, Chn. Bldg. Committee, Lamesa, Tex., awarded contract for the construction of a 2 story, 72 x 130 ft., to H. C. Allen, Lamesa. Estimated cost including equipment $200,000.

Milk Plant — Milk Products Co., C. A. Harpster, Secy., Hiawatha, Kan., will soon award contract for a 2 and 3 story, 72 x 130 ft. milk plant at Utah and 10th Sts. Estimated cost $200,000. Douthitt Engineering Co., 108 West Monroe St., Chicago, Ill., is engineer.

Milk Products—North Louisiana Dairy Products Co., Inc., T. H. Mills, Pres., Ruston, La., will soon award contract for the construction of a 72 x 130 ft. milk plant. Estimated cost $45,000. Douthitt Engineering Co., 100 West Monroe St., Chicago, Ill., is architect.

Milk Plant—Sego Milk Products Co., Kearns Bldg., Salt Lake City, Utah, awarded contract for the construction of a milk plant to L. Fetzer, Salt Lake City. $35,000. Equipment to be purchased.

Cold Storage Plant—Central Power & Light Co., Frost Bldg., San Antonio, Tex., awarded contract for the construction of a 3 story, 69 x 90 ft. cold storage plant at Harlingen, to W. A. Velten, Brownsville, $69,199.

Cold Storage Plant—F. Hertler, 118 Lawrence St., New Haven, Conn., awarded contract for the construction of a 1 story, 52 x 150 ft. bologna factory including storage plant on State St. to M. H. Teitelman, 42 Church St., New Haven. Estimated cost $45,000.

Cold Storage Warehouse—Pennsylvania R.R. Co., Pennsylvania Station, New York, N. Y., is having plans prepared for the construction of second unit of cold storage plant and warehouse at Exchange Pl. and Hudson River. Estimated cost $1,000,000. Terminal Development Co., 25 Church St., New York, N. Y., is engineer. Pennsylvania Dock Co., 25 Church St., New York, is lessee.

Cold Storage Warehouse, etc.—U. S. Cold Storage Warehouse Co., West Pershing Rd., Chicago, Ill., awarded contract for a 22 story, 176 x 362 and 156 x 340 ft. cold storage warehouse and office at Central Ave. and Taylor St., to E. W. Sproul, 2001 Pershing Rd., Chicago, Ill. Estimated cost $3,000,000.

Ice Plant—Boston Ice Co., 11 Deerfield St., Boston, Mass., awarded contract for the construction of a 120 ton ice plant on East Eagle St., East Boston, to Vappi & Ferguson, 515 Massachusetts Ave., Cambridge. Estimated cost $80,000.

Ice Plant—Central Power & Light Co., Frost Bldg., San Antonio, Tex., will soon award contract for a 1 story, 70 x 90 ft. ice plant at Raymondville. J. Marriott, Frost Bldg., San Antonio, is architect and engineer.

Ice Plant—Hill & Morton, Brownsville, Tex., will build a 15 ton ice plant at Raymondville. Estimated cost $30,000.

Ice Plant—Knickerbocker Ice Co., 41 East 42nd St., New York, N. Y., has work under way on the construction of a 54 x 85 ft. ice plant at Proctor St. and Edsall Ave., Glendale. Estimated cost $40,000.

Ice Plant—Metropolitan Ice Co., 321 Washington St., Somerville, Mass., awarded contract for an addition and alterations to ice plant on Leland St. to Vappi & Ferguson, 515 Massachusetts Ave., Cambridge. Estimated cost $60,000.

Ice Plant—Mountain Ice Co., 51 Newark St., Hoboken, N. J., will build addition to ice plant on Passaic Ave., Kearny. Estimated cost $40,000. Private plans. Work will be done by separate contracts.

Ice Plant—National Service Co., 150 Congress St., Boston, Mass., will soon award contract for the construction of an ice plant at Woonsocket, R. I. Private plans.

Ice Plant—Rubel Ice Corp., c/o A. W. K. Billings, Jr., 80 Boylston St., Boston, Mass., Archt., awarded contract for the construction of a 1 story, 100 x 300 ft. ice plant at 200 Geneva Ave., Dorchester, to A. Rotelli, 681 Broadway, Providence, R. I. Estimated cost $100,000.

Ice Plant Addition—Rubel Coal & Ice Co., 937 Fulton St., Brooklyn, N. Y., will receive bids about Mar. 1, for the construction of addition to ice plant at India Wharf and Conover St. Estimated cost $40,000. H. J. Nurick, 44 Court St., Brooklyn, is architect and engineer, also awarded contract for a plant at 21st and Neptune Ave., to G. Jensen, 8124 11th Ave., Brooklyn, $90,000.

Ice Plant—Southern New England Ice Co., R. G. Hadley, 48 Edwards St., Hartford, Conn., will soon award contract for the construction of an ice plant. Estimated cost $150,000. R. B. Engineering Corp., 11 East 42nd St., New York, N. Y., is engineer. Contract let for equipment.

Ice Plant—Southern United Ice Co., F. I. McConglish, Dist. Engr., McComb, Miss., plans to remodel ice plant. Estimated cost $75,000. Work will be done by owner's forces.

Ice Manufacturing Plant—Southern New England Ice Co., 75 Howard St., New London, Conn., awarded contract for a 1 story, 100 x 170 ft. ice manufacturing plant to Bartlett-Brainard Co., 252 Asylum St., Hartford. Estimated cost $75,000. Ice making equipment to cost $20,000 will be required.

Grocery Warehouse — O'Berry & Hall, 701 Whiting St., Tampa, Fla., plans to rebuild grocery warehouse at Orlando recently destroyed by fire.

Grocery Warehouse — United Grocers, Inc., 414 P. St., Fresno, Calif., plans the construction of a 150 x 200 ft. grocery warehouse at R and Inyo Sts.

Produce Warehouse—Great Atlantic & Pacific Tea Co., Grant Bldg., Pittsburgh, Pa., awarded contract for the construction of a 2 story, 160 x 252 ft. produce warehouse at 43rd St. and Pennsylvania R.R. to Foster Engineering Co., 726 Indiana Ave., Indianapolis, Ind.

Macaroni Factory—Savoia Macaroni Co., 1535 63rd St., Brooklyn, N. Y., will receive bids about May 1 for the construction of a macaroni factory at 63rd St. and 15th Ave. Estimated cost $100,000. F. Savignano, 6005 14th Ave., Brooklyn, is architect.

Salt Plant—O. F. Friest and H. Rountree, Austin, Tex. is having surveys made for the construction of a salt plant at Sonora. Estimated cost $25,000.

Feed Mill and Warehouse—Model Mill Co., Johnson City, Tenn., will soon receive bids for the construction of a 6 story, 50 x 200 ft. feed mill and warehouse. Horner & Wyatt, 470 Bd. of Trade Bldg., Kansas City, Mo., are architects.

Flour Mill—Vitamin Milling Co. of Canada, W. B. Brooks, Mgr., 503 McKinnon Bldg., Milinda St., Toronto, Ont., plans the construction of a flour mill, 300 bbl. daily capacity, on First St., Tavistock. Estimated cost $60,000.

Grain Elevator — Dept. of Public Works, Parliament Bldgs., S. E. O'Brien, Secy., Ottawa, Ont., awarded contract for electrical work for a 5,000,000 bu. grain elevator at Prescott, to Mahon Electric Co., 603 Victoria Ave., Fort William. $130,000. Total estimated cost $4,000,000; also plans four 2,000,000 bu. grain elevators at Fort Churchill, Ont., $1,500,000 to $2,000,000. K. M. Cameron, Ottawa, is chief engineer.

Grain Elevator—Farmers Union Jobbing Co., Salina, Kan., plans the construction of a grain elevator, 1,500,000 bu. capacity.

Grain Elevator — Oklahoma Wheat Growers Association, L. W. Shields, Enid, Okla., will receive bids until Feb. 1 for the construction of a grain elevator, 1,000,000 bu. capacity. Estimated cost $350,000. Horner & Wyatt, 468 Bd. of Trade Bldg., Kansas City, Mo., are engineers.

Grain Elevator—Searle Grain Co., 1254 Chamber of Commerce Bldg., Minneapolis, Minn., awarded contract for an 8 story, 45 x 54 x 180 and 52 x 52 x 70 ft. grain elevator including work house and grain storage tanks, to Fegles Construction Co., 711 Wesley Temple Bldg., Minneapolis. Estimated cost $150,000.

Grain Elevator—Superior Feed Mills Co., 2126 West Ash St., Oklahoma City, Okla., awarded contract for the construction of a grain elevator on Noble St., to W. Lambert, 1812 West 16th St., Oklahoma City. Estimated cost $35,000.

Grain Loading, Equipment, etc. — Montreal Harbor Commission, 57 Common St., Montreal, Que., plans improvements to include the installation of grain loading equipment on Alexandra pier, maintenance repairs in grain elevator system and installation of additional conveyor belt in grain conveyor galleries at the outer ends of three main piers. Total estimated cost $300,000.

Meat Distribution Plant—J. Morrell & Co., Sioux Falls, S. D., plans the construction of a 1 story, 70 x 75 ft. meat distribution plant at 19 Main St. Estimated cost $40,000.

Packing and Service Plant—Armour & Co., 120 Broadway, New York, N. Y., will soon award sub-contracts for the construction of a 4 story packing and service plant at 608 West 40th St., for C. E. Appleby, 17 John St., New York. Estimated cost $250,000. New York Butcher's Dressed Meat Co., 491 West 39th St., New York, is lessee.

Packing Plant (Pork)—W. Wight & Co., 60 Paton Rd., Toronto, Ont., awarded contract for a 2 story addition to pork packing plant to John V. Gray Construction Co., Northern Ontario Bldg., Toronto. Estimated cost $100,000.

Packing Plant — Lake Hamilton Citrus Growers Assn., c/o L. Anderson, Lake Hamilton, Fla., had plans prepared for the construction of a 1 story, 80 x 100 ft. packing plant. Estimated cost $40,000. C. F. Kuhn, Winter Haven, Fla., is architect.

Packing Plant—J. E. Decker & Sons Packing Co., 320 15th St. N. W., Mason City, Ia., will soon receive bids for a 5 story, 137 x 203 ft. packing plant. Estimated cost $350,000. Henschein & McLaren, 1637 Prairie Ave., Chicago, Ill., are architects.

Packing Plant—Rath Packing Co., Sycamore and Elm Sts., Waterloo, Ia., awarded contract for the construction of a 4 story, 40 x 100 ft. tankage on Division St. to Jens Olsen & Sons Construction Co., 1522 Lafayette St., Waterloo. Estimated cost $40,000.

Packing Plant — Seaboard Air Line R.R., Savannah, Ga., plans a 1 story, 120 x 123 ft. addition to plant including pre-cooling room, etc. at Winter Haven, Fla. to Bland & Foster, Winter Haven. W. G. Roe, Winter Haven, lessee.

Packing Plant—Vincennes Packing Co., Vincennes, Ind., will soon award contract for the construction of a 2 story, 110 x 150 ft. packing plant at State and Manilla Sts. Estimated cost $60,000. J. B. Bayard, Vincennes, is architect.

Slaughter House—Annetonotti Povoromo, 238 East 29th St., New York, N. Y., plans the construction of a 25 x 80 ft. slaughter house on Eastern Blvd. Estimated cost $20,000. A. T. Pryor, 959 8th Ave., New York, is architect.